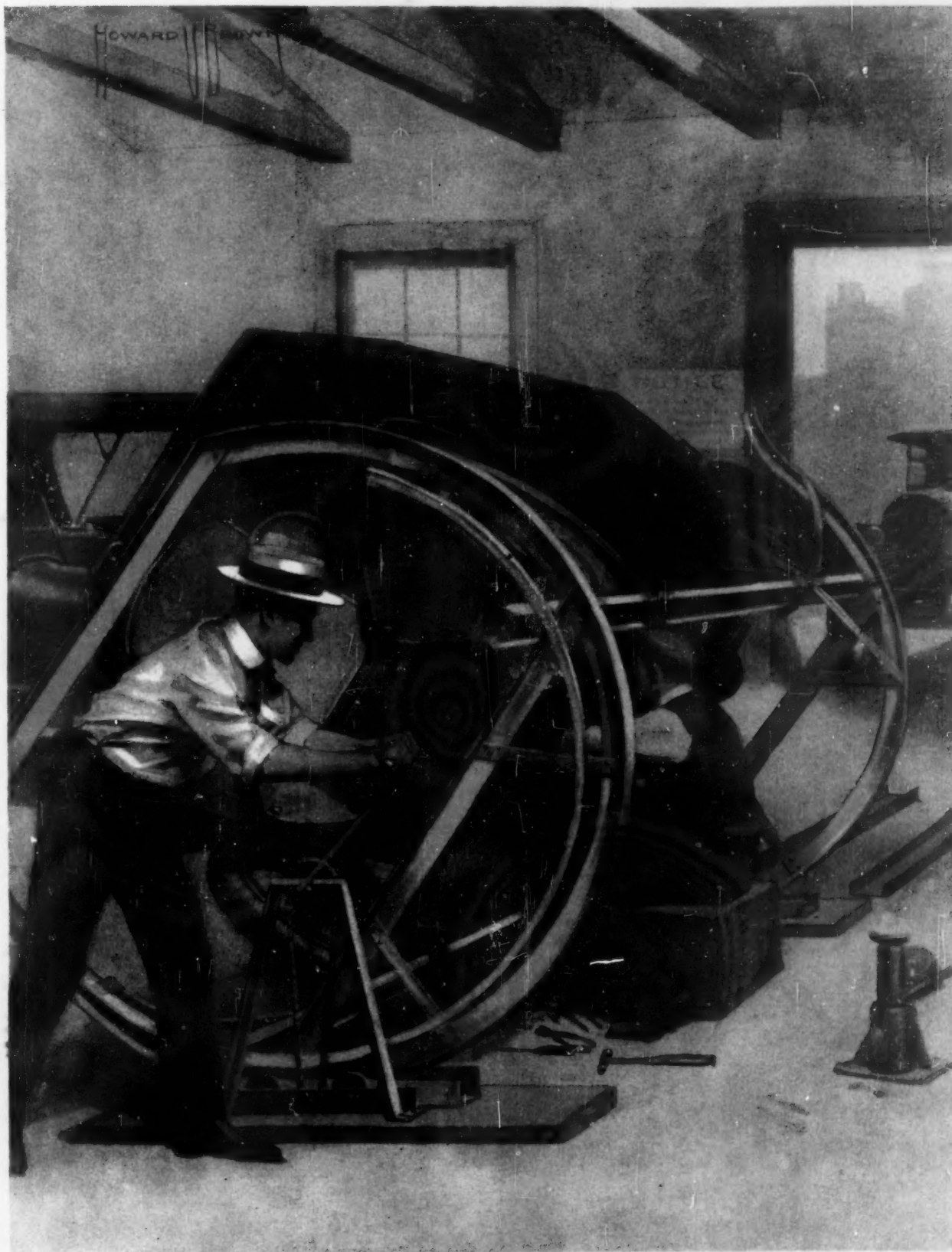


GENERAL LIBRARY  
JUL 28 1919  
UNIV. OF MICH.

When you finish reading a magazine bearing this notice, place a 1-cent stamp on this notice, mail the magazine, and it will be placed in the hands of our soldiers, sailors or marines. NO WRAPPING. NO ADDRESS.  
A. S. Burleson, Postmaster General.

# SCIENTIFIC AMERICAN

Entered as second class matter June 18, 1870, at the post office at New York, N. Y., under the Act of March 3, 1879.



TURNING THE AUTOMOBILE OVER TO GET AT THE UNDER SIDE.—[See page 87]

Vol. CXXI. No. 4  
July 26, 1919

Published Weekly by  
Scientific American Publishing Co.  
Munn & Co., New York, N. Y.

Price 10 Cents  
\$5.00 a Year



The manager of a mining company writes, "I have been using your Gargoyle 600 W Cylinder Oil for the last three months with every satisfaction, only one-third of the oil previously used being necessary to give perfect lubrication."



A tramway company reports, "Your Gargoyle Cylinder Oil is higher in price than the one formerly used, but we have been able to get better lubrication from 40 gallons of it than from 80 gallons of previous oil. The net saving is 35%."



## ENGLAND



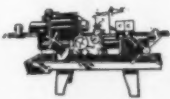
A Dutch user writes as follows about Gargoyle Lubricants, "Sinds 1895 hebben wij uwe olie soorten etna voor de weefstoelen en transmissie en 600 W voor de cylinders in gebruik en hebben de groote smeerkraft geconstateerd."

## CEYLON



An engineer reports, "Gargoyle Lubricants have been used for some time past on all kinds of machinery, rolling stock, dredging craft, etc., and have answered very satisfactorily in the place of native and other oils, in that it lubricates more efficiently and is cheaper in the end."

An Italian user of 1000-horse-power engines finds Gargoyle Lubricants "superior to all others." He states, "A vostra richiesta ben volentieri attestiamo che i vostri lubrificanti per cilindri e movimenti di macchine a vapore che dal mese di Novembre, 1896, usiamo per le nostre motrici di 1000 H. P., eccellono per bontà e superiorità, ed hanno il merito speciale di essere sempre dello stesso ed ugual tipo e di essere somministrati colla massima accuratezza."

Mill, Mine and  
Railway SuppliesTrucks and  
Wheelbarrows

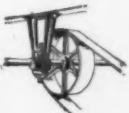
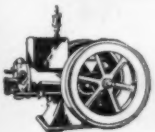
Machine Tools



Scales



Valves

Power  
TransmissionEngines and  
PumpsAutomobile and  
Service Station  
EquipmentOur Guarantee  
goes on all we sell

## Untangle your Buying

*How The Fairbanks Company O. K. certifies  
and simplifies your purchases*

FROM dealing with many houses  
—many orders—many bills—to—

One house—one order—one bill.  
That is why more and more Purchasing  
Agents are turning for their  
mechanical equipment and supplies to  
The Fairbanks Company.

And that is how they are taking  
the tangles out of their buying.

Here is another factor of equal or  
greater importance: Many houses  
mean many standards of quality.  
The Fairbanks Company sells only  
supplies that are worthy of "The  
Fairbanks Company O. K."

"The Fairbanks Company O. K."

goes on everything we sell—mill,  
mine and railway supplies, power  
transmission, scales, engines and  
pumps, trucks and wheelbarrows,  
machine tools and valves and auto-  
mobile and service station equipment.

"The Fairbanks Company O. K."  
means O. K. in quality, O. K. in per-  
formance, O. K. in price.

Let "The Fairbanks Company  
O. K." take the tangles out of your  
buying. Save time, money, bother,  
doubt. The Fairbanks Branch Houses  
are listed here. They are at your  
service. Look up the nearest one.  
There you will find full stocks, prompt  
attention and quick deliveries.



### Branch Houses:

Albany	New York
Baltimore	Paterson
Birmingham	Philadelphia
Boston	Pittsburgh
Bridgeport	Providence
Buffalo	Rochester
Chicago	Scranton
Detroit	St. Louis
Hartford	Syracuse
Newark	Utica
New Orleans	Washington

HAVANA, CUBA LONDON, ENGLAND  
BIRMINGHAM, ENGLAND  
GLASGOW, SCOTLAND PARIS, FRANCE

THE FAIRBANKS COMPANY  
Administrative Offices: - New York

The  
**FAIRBANKS**  
Company



MILL, MINE & RAILWAY SUPPLIES SCALES VALVES POWER TRANSMISSION  
MACHINE TOOLS TRUCKS & WHEELBARROWS ENGINES & PUMPS AUTOMOBILE AND SERVICE STATION EQUIPMENT

# "PERFORMANCE COUNTS"



SCIENTIFICALLY engineered throughout, MACK Trucks combine reserve power and strength for big capacity loads with unusual lightness. The making of MACK cylinders illustrates a refinement of manufacture that is typical. Cast in pairs, the cylinders are carefully *annealed* to remove internal stresses before being reamed to exact size. This annealing of cylinders—practically exclusive to MACK manufacture—prevents warping out of round in service, gives greater toughness and evenness of metal texture—longer and more efficient service.

Capacities 1 to 7½ tons—tractors to 15 tons. Special bodies and mechanical equipment.

Full details and specifications on request.

INTERNATIONAL MOTOR COMPANY  
NEW YORK

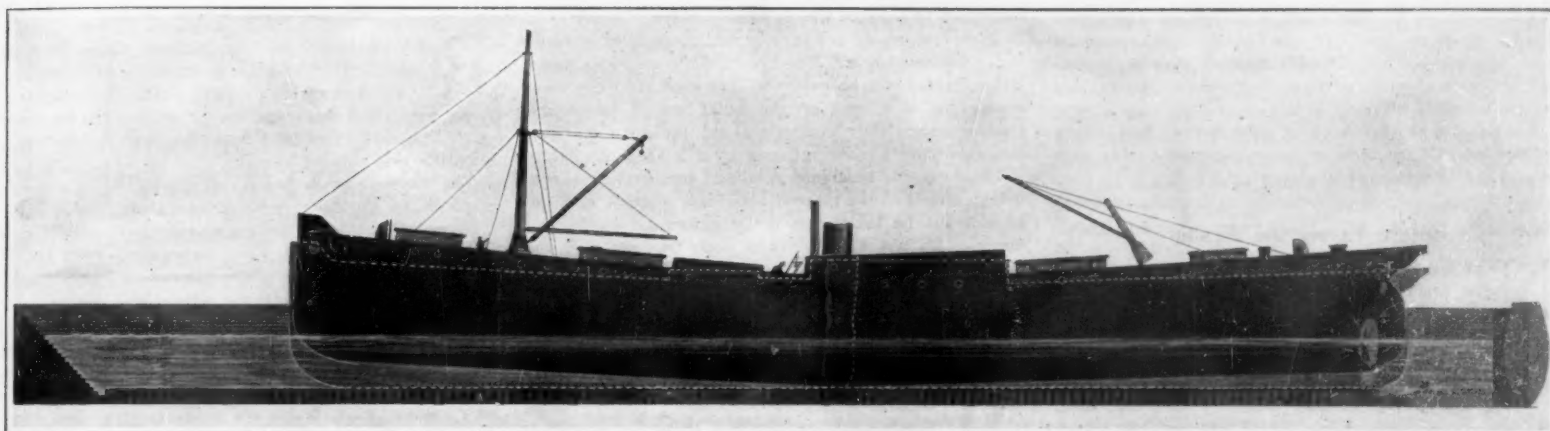
# SCIENTIFIC AMERICAN

THE WEEKLY JOURNAL OF PRACTICAL INFORMATION

VOLUME CXXI  
NUMBER 4

NEW YORK, JULY 26, 1919

10 CENTS A COPY  
\$5.00 A YEAR



The "Curaca" in dry dock before and after the work of repair, showing the extent to which she was buckled. The darker outline represents her shape when she was docked, the lighter after the buckle had been corrected. The dotted white line shows the line along which she was cut open, and is approximately the line of buckling.

## Repairing a Buckled Ship

IN the reconstruction of the British ship "Curaca," a leading dry-dock concern of Brooklyn has found itself confronted with some problems, whose solution demanded a very considerable degree of ingenuity. The vessel in question was sunk during the great explosion in Halifax Harbor. Her superstructure was blown away, and she was buckled amidships. So serious was this distortion that when the vessel was refloated at the scene of the disaster her draft was 7 feet at the bow, 9 feet 8 inches at the stern, and 16 feet 2 inches at the buckle. In other words, the hull had been distorted in amounts varying from 6 feet 6 inches at one end to 9 feet 2 inches at the other.

In this condition the "Curaca" was raised, pumped out, temporarily repaired to the extent necessary to make her float, and brought to New York under her own steam—a sufficiently remarkable achievement in itself. The work of permanent repairs commenced on April 26th.

The big problem of course was the restoration of the vessel to an even keel; and at first sight this appeared impossible. The repair company refused to let it go at that, however, and finally their vice president, George J. Robinson, evolved a plan which subsequently proved effective. His report on the job tells the story about as well as it can be told.

"We decided to use graving dock No. 2 for the 'Curaca.' Keel blocks were set solid for a length of 36 feet, as it had not been determined exactly where the buckle was located. The vessel was warped in, placed over the blocks and plumbed up. Shorings from each side of the dock were then put in place against the sides of the vessel. Wire hawsers were extended from each side of the deck and made fast ashore, so that there would be no danger of either the forward or after section's listing if a break should develop at the point of buckling before the straightening should be completed.

"The dock pumps were then started. As soon as the buckled area of the keel touched the blocks the pumps were stopped and examination made to insure that the vessel was perfectly upright and over the blocks. At the same time it was possible to locate the buckle with accuracy. The sides of the ship were then gradually cut at the buckle on both sides, from the deck to the water line."

Of course at the moment the incision could go no further without flooding the ship. The whole procedure, therefore, depended upon the expectation that as the cut progressed and left an ever narrower section of metal to support the overhanging stern and bow, these would settle. Plainly if this expectation were realized the settling of the ship's ends would throw her center upward, and the bottom of the cut would be again above the water line, so that the operation could be repeated.

"Close observation showed," says Mr. Robinson, "that as the cutting of the plates and the pumping away of the water progressed the ends of the 'Curaca' dropped gradually, being without the support of the blocks. The cutting was continued about six inches at a time. During the operation frequent inspections were made to determine that both the forward and the after sections remained upright, that the hull had not twisted, and that no other unexpected structural changes had resulted. No such hitch was encountered; and when the dock had been pumped entirely dry the

whole length of the 'Curaca's' keel rested on the blocks."

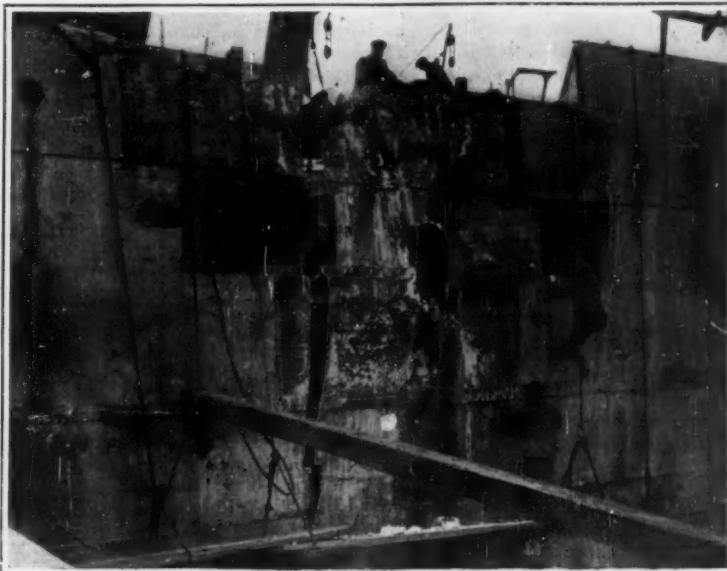
This delicate operation was begun at 7.30 A. M., and brought to its successful conclusion at 3 P. M. on the same day. The process amounted really to a bisection of the vessel, since it was found, when the dock was cleared of water, that the bottom plating around the buckle had fractured, due probably to the vessel's having worked at this point. Her bottom was also damaged to such an extent by the explosion, aside from the immediate consequences of the buckling, that 54 of her bottom plates had to be repaired or renewed.

This business of repairing the buckled ship by cutting her apart and putting her together again represents a very daring conception. It will be realized that it involved something quite different from the bisection of a ship (as for transportation through the Welland Canal) when she is standing on an even keel. There was only the engineering instinct of the dry-dock people to guarantee that the strains upon the portions of the ship left unsupported by the cleavages would not be great enough to lead to a collapse that would get out of control. Nor was it possible to guard against this eventuality by bracing of any sort, because the whole success of the work depended upon the coming of the collapse—and its remaining under control.

## Tinfoil in Condensers

THIN sheets of metallic substances are of much value in commercial applications, and are prepared in a variety of forms, and of surprising thinness. Thus gold-leaf may be beaten out to a sheet .000005 inch or even less in thickness, and other metals are similarly reduced. Of course it requires great ductility to begin with before such performance is possible.

When used in mechanical or scientific work these products are usually somewhat thicker than this, and are then known as foils. Mirrors are made by applying silver leaf or foil to the back of the glass. Tinfoil, the commonest of all these products, has a wide variety of uses. One of the most interesting of these is in the condenser of a magneto. A condenser consists of from 50 to 200 sheets of tinfoil, alternating with mica in expensive condensers, or with paraffined paper in the cheaper sorts. Each substance is thus completely insulated from the other and alternately connected with one side of an electric circuit.



Cutting the "Curaca" in two along the line of her buckle, so that the up-standing bow and stern could settle into normal position again.

# SCIENTIFIC AMERICAN

Published by Scientific American Publishing Co.

Founded 1845

New York, Saturday, July 26, 1919

Munn & Co., 233 Broadway, New York

Charles Allen Munn, President; Orson D. Munn, Treasurer  
Allan C. Hoffman, Secretary; all at 233 Broadway

Entered at the Post Office of New York, N. Y., as Second Class Matter  
Trade Mark Registered in the United States Patent Office  
Copyright 1919 by Scientific American Publishing Co.  
Great Britain rights reserved  
Illustrated articles must not be reproduced without permission

*The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.*

*The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.*

## Nature Favors the Airship

**N**OT the least valuable feature of the visit of R-34 to America was the fact that, during the five days of her stay, the great ship was anchored in the open, and exposed to all the possible mischances of wind and weather. Never had such a thing happened before. Always, when the airship made her landing, she took the ground in close proximity to a vast shed, into which she was hauled with all possible speed. Within this snug shelter the fragile monster remained; nor did it venture forth except for instant flight. In planning for the visit of the R-34 to America, the British authorities decided to limit the stay on this side to eight hours, influenced no doubt by the risks of an open anchorage. From eight hours to five days is a big advance, and it is progress in the right direction.

For the ship of the air must be as independent of the airshed as the seagoing ship is of the drydock. What would happen to seaborne commerce, if, for every vessel that is launched, it was necessary to build a drydock, to which the vessel must go on making port and in which it must stay until the cargo is unloaded and another taken aboard?

Airsheds, of course, must be provided where the ships may go for refitting and repairs; but to attempt to build a \$2,000,000 shed for every \$2,000,000 ship, is to fasten a burden upon the new venture that would cramp its growth and ultimately break its back. Nor is it necessary—as the recent experiment at Mineola has proved, or at least suggested. The lofty mooring mast will take the place of the airshed, and the airship will lie to that mooring as safely and snugly as a "Leviathan" or a "Mauretania" alongside her pier. Furthermore, the airship will make fast in a mere fraction of the time that it takes to dock an ocean steamship, be she big or small.

The airship has another advantage over her sister of the sea in the fact that, in her three-dimensional flight, she is not hampered by any considerations of the width or depth of the channels through which she travels.

The limit of size in steamships is not determined by any structural difficulties in the ship itself. Ships of from six hundred to one thousand feet in length would have made their appearance many years earlier than they did, if it had been a question of the ability of the great shipbuilding firms to construct such ships. The limitations on size have been those imposed by nature, such as the depth of the entrance channels to harbors, or their width as affecting the safe flow of traffic. Also in such conditions as obtain in the Hudson River, New York, the length of the ships and the piers at which they lie, is restricted by the necessity for preserving a sufficiently wide channel between the pierhead lines on opposite sides of the river.

Now the airship is not subjected to any of these restrictions. So far as the pathways of the air are concerned man is free to make his airship as long and bulky as he may please. This will prove to be a most valuable condition as airships grow to dimensions as yet undreamed of. Being free from any restrictions as to length and depth, it will be possible to build airships capable of

carrying even as much as one thousand tons without exceeding the limitations of the shipbuilders' skill and resources.

The British, according to a recent official dispatch, are already building a vessel 1,000 feet in length with a capacity of 100 tons. This means that a 2,000-foot ship, if allowance is made for the relative economy of weight that will go with great size, should carry nearly 1,000 tons of useful load.

Now a 500-foot mooring mast would take care of a 2,000-foot ship, and a 500-foot mast, though it would be heavier in construction; would be less in height than many of the masts which carry radio antennae. Nor would the pull on the mast, even in a gale of wind, be comparable to the pull of an ocean liner on her anchorage. The careful streamlining of an airship reduces head-on resistance to a figure which, even in ships of from 1,000 to 2,000 feet, would call for no great massing of material in the mooring tower. The towers of the proposed North River Bridge will be over 600 feet high, and the wind stresses on them and on the 5,000 feet of cables and trusses which they support would far surpass those thrown upon its mooring tower by a 2,000-foot airship.

The danger of combined wind and temperature effects bringing the tail of a moored vessel into contact with the ground will be taken care of by automatic appliances, designed to act quickly upon both the gas and the deadweight ballast. These controls will be so perfect that vertical oscillations, when the ship is anchored, will be practically eliminated.

## An Unusual Service

**W**HEN the Government called upon the Navy to turn a number of its larger fighting ships into transports and use them in returning our troops from France, it set a precedent which, in the interest of the Navy, should never be followed. It is understood, of course, that requisitioning of these costly ships for transport service was an emergency measure. There were some two million men in France, clamoring to come home, the majority of whom were no longer required for military duty in Europe. The British, whose ships had carried one-half of our troops to France, were anxious to return their own colonial forces from France, and could spare only a few of their fast ships for our use. Every American ship that could transport men was called into service; but it was realized that unless the Navy could render further assistance (it was already manning the transports) several hundred thousand men would have to wait for many weeks in France before they were brought home.

It is to the credit of the Navy that, although battleships and armored cruisers were never intended to carry a man more than their full complement of officers and men, a total of 269,456 troops were brought back from France on our fighting ships.

It is when we come to inquire how the thing was done that the reluctance of the officers of the Navy to use the ships in this way is understood and justified. For the only possible way to carry soldiers on ships that were already full up with sailors, was to break up the organization of each ship, get rid, for the time being, of a large part of the highly-trained crew, and run the vessel as a transport.

What this involved in disrupting the organization will be understood when it is stated that the first men to be removed were the gun crews, and particularly those that served the primary batteries—the 12-inch guns in the turrets. If there is any one group of men on a battleship that is of preëminent value, it is the gun crews of the main batteries.

Now it takes many months of careful training to bring the gunnery of a battleship or armored cruiser up to the high water mark of battle conditions. Every ship has its own individuality; so has every big gun on the ship; and a first-class gun pointer on a 14-inch gun of the "New York" will take some little time to adjust himself to a 12-inch gun on the "Wyoming." The same thing is true of service in the magazines, in the handling rooms, at the ammunition hoists, or on the fire-control platform. The same specialization is found in the boiler and engine rooms; in the pilot house, in the paymasters' department—anywhere, in brief, from the main truck to the keel of the ship.

So the turning over of these ships to transport service was at a heavy sacrifice of naval efficiency, so far as the

fighting efficiency of the Navy was concerned. On July 1st they were restored to purely naval duty; but it will be many months before they have been brought again up to the high state of efficiency which they had reached when they undertook transport service.

There is one compensation, however, to which we attach great importance, namely, that over a quarter of a million picked American young men, by traveling on our fighting ships, have been given an intimate view of life in the Navy, which they could have obtained in no other way. We understand that many of them expressed their intention of joining the Navy; and as to the others, this much is certain, that the soil has been well prepared for the seed which will be scattered broadcast this year by the recruiting service.

## Inconclusive Germ Duels

**R**EGARDLESS of the motives which have inspired the advertised germ "duel" between two doctors in St. Paul, their ill-advised zeal justly merits the condemnation not only of the bacteriologist, but of all intelligent men who have the welfare of scientific medicine at heart.

The advance press notice, as quoted from a special dispatch to the New York Times (July 13th), reads: "To prove his theory that germs do not cause disease an 'electropath,' of St. Paul, today challenged Dr. H. W. Hill, executive officer of the Minnesota Public Health Association, to a duel to the death with germs. Dr. Hill accepted the challenge and the two will expose themselves to the most virulent of contagious diseases, including typhoid, smallpox and bubonic plague. The electropath will use in his defence against the germs only sanitation, pure air and sanitary food and drink. Dr. Hill will expose himself after scientific inoculation and vaccination."

The deplorable feature of the whole affair is that no conclusions can warrantably be drawn, regardless of the outcome, and science will be not one whit advanced, because in the very nature of the experiment a fundamental scientific dictum is ignored. Conclusions drawn from a single experiment are unwarranted. Individual idiosyncrasies, natural immunity, subtle and often little understood factors, which in a given person determine the delicate balance between infection and resistance, all tend to make it evident that only from a carefully controlled series of experiments upon a series of individuals can trustworthy conclusions be drawn. One swallow does not make a summer; one swallow of B. typhosus does not necessarily make for typhoid fever.

Perhaps the most unfortunate feature of the notoriety which accrues to such an affair is the possible ill-effect this experiment may have upon the public at large. Discriminating judgment upon things scientific resides neither in the layman nor in the lay-press. If the militant electropath should possess either an acquired or a natural immunity to smallpox, for instance, and should fail to develop the disease even after smearing the contents of smallpox pustules over his face, the fact would be heralded from coast to coast, to the bitter detriment of the unthinking, who are often only too eager to discount the protective measures upon which our public health is founded.

Any diminution in individual or collective zeal in guarding the community against the ravages of smallpox, typhoid fever or bubonic plague is to be deprecated. And condemnation is justly to be directed against any scientific or pseudo-scientific man who, directly or indirectly encourages people to base their belief or disbelief upon the outcome of a single experiment.

## The Possibilities of Peat

**T**HE Commercial Museum of Philadelphia has been holding a large exhibition to illustrate the possibilities in the utilization of peat. There are about 11,188 square miles of peat bog in the United States, capable of producing more than 12,000,000,000 tons of fuel. The exhibit shows how, apart from its use as fuel, peat may be spun into yarn, made into paper, used for packing, etc. It is valuable as a preservative, as it contains large amounts of humic acid. Ground up peat may also be used as a filler for fertilizer, making possible the use of slaughterhouse waste for this purpose; also as a filler for stock feed, such as molasses. Its manufactured products include insulations, soundproof boards, paving stones, and alcohol.

## Engineering

**Federal Endowment of Mining Schools.**—A bill was recently introduced into the Senate providing for the expenditure of \$25,000 per year in each State to aid mining schools; the money coming from sales of public lands. This government aid will be for instruction, research and experiment in mining machinery, mining engineering and treatment, metallurgy, assaying and chemistry and geology. One of the principal aims of the bill is to study the prevention of explosions, fires, etc., and to promote the general welfare of miners and operators.

**Copper in Rustproof Steel.**—In a paper recently read by D. M. Buck before the American Society for Testing Materials, it was brought out that very small amounts of copper have the effect of reducing corrosion in steel. Tests were made of open hearth steel with various copper additions, so that there was from 0.012 to 0.254 per cent of copper in the ingots. These were rolled into sheets and exposed to the atmosphere in the Connellsville coke region, together with a number of pieces in which there was no copper. It was found that a mere trace of copper was sufficient to prevent rapid corrosion.

**Agitating Concrete While Placing.**—A paper recently read by D. A. Abrahams before the American Concrete Institute describing some interesting experiments on effect of vibration and pressure on concrete during placing. The tests show that this treatment may actually be harmful if carried on too long or too severely. The principal advantage of vibration consists in permitting the use of dryer concrete; it assists in placing concrete in intricate forms, and bringing it in close contact with reinforcing bars. Pressure applied during the molding results in an increase of compressive strength of the concrete, but after the first fifteen minutes or so there is no added effect.

**"Macro-Etching and Macro-Printing."**—Under this title J. C. W. Humphrey of Sheffield recently read a paper before the Iron and Steel Institute in which he pointed out a new method of etching steel so that its structure could be studied. The solution used is 120 grams of copper ammonium chloride, 50 cubic centimeters of hydrochloric acid and 1,000 centimeters of water. This solution will etch a specimen so deeply that prints may be made from it with ordinary printer's ink and a copying press. It is unnecessary to obtain a highly polished surface, but the steel may be smoothed off with emery. A neutral solution is used until all traces of emery scratching are removed. The acid attacks the purer metal and the impurities which resist the acid stand out in high relief.

**Rebuilding the Union Station at Indianapolis.**—It is a difficult matter to maintain traffic while reconstructing any portion of a railroad; such work always calls for a great deal of ingenuity. In the case of the Union Station at Indianapolis it was necessary to raise the tracks and erect a new station while maintaining 165 passenger trains per day, 70 of which were through trains, with some 60 freight trains. Fortunately the station was to be widened on the south side, which made it possible to build two new track sections on the elevated grade, and after these tracks were built they were put in service while two of the old tracks were elevated to the new grade. The work is still in progress and is proceeding rapidly. After the new tracks are completed the trainshed will be erected. The station is situated at the north side of the tracks and there is a passenger subway with stairs leading up to the station platforms.

**Fireproofing Concrete Columns.**—We have been wont to look upon concrete as capable of resisting a great deal of heat, and it may seem strange to think of coating it with a fireproof material. However, there are conditions under which this is necessary. The Bureau of Standards has been investigating the condition of concrete which has passed through conflagrations, and has found that if the concrete is made with gravel, particularly siliceous gravel, there is a tendency for the stones to burst in extreme heat, which disintegrates the concrete. Accordingly it is recommended that gravel be avoided wherever possible, but if impossible the gravel concrete may be protected from extreme heat by coating it with an inch of cement held in place by a wire mesh. Plasters may also be used in which asbestos is the principal constituent.

## Science

**A Handbook of the Useful Plants of tropical and subtropical America** is in course of preparation in the U. S. Bureau of Plant Industry, in Washington. The Bureau states that this work will serve to answer innumerable questions which are constantly received from commercial and manufacturing firms, scientists, other branches of the Government, etc., concerning food and forage plants, drugs, tanning and dye plants, narcotics, poison plants, oils, copals, balsams and gums.

**A Speedy Antelope.**—According to a communication addressed from China to the American Museum of Natural History by Mr. Roy C. Andrews, the Mongolian antelope (*Gazella gutturosa*) can run at a speed of at least 60 miles an hour. Mr. Andrews reports a case in which while he was riding in a motor car at 40 miles an hour, by speedometer, a herd of antelope started up nearly opposite the car, and circled around ahead, keeping at the same distance from the car. When shot at they quickened their pace—perhaps to 70 miles an hour. Mr. Andrews says: "One had a strange impression that they were skimming the ground, for their legs appeared only as a blur."

**A Notable Ethnological Expedition.**—The Rev. John Roscoe, for many years a missionary in Uganda and author of two standard works on the people of that region, left England last April to conduct an expedition into the territory west of Victoria Nyanza, for the purpose especially of studying the various pastoral tribes that occupy the elevated grasslands between Victoria Nyanza and the western Rift Valley. The cannibal tribes about Mt. Elgon may also be visited. The expedition is expected to be in the field for two years. Its work will be supervised by a committee of the Royal Society. Sir James G. Frazer, the eminent anthropologist and folklorist, has been the leading spirit in launching this undertaking.

**An Acoustical Laboratory.**—A note in *Science* reports the completion of the acoustical laboratory at Riverbank, Geneva, Ill., which was built for the late Prof. W. C. Sabine, of Harvard University, by his friend Col. George Fabyan. This laboratory was planned by Prof. Sabine to enable him to carry out the study of various problems in architectural acoustics requiring special building construction and entire freedom from extraneous noises, and was just ready for occupancy at the time of his death. The research program planned by Prof. W. C. Sabine will be carried out, as far as possible, by Dr. Paul E. Sabine, who has resigned an assistant professorship of physics at the Case School of Applied Science to take charge of the laboratory.

**The Journal of Industrial Hygiene.**—A great deal has been heard in the last few years about industrial hygiene. This rapidly growing branch of preventive medicine can now boast of a journal of its own, the initial number of the *Journal of Industrial Hygiene* having recently made its appearance. It is a monthly publication, and is edited by David L. Edsall for the United States and by A. F. Stanley Kent for Great Britain. Besides numerous original articles, the new journal is to include copious abstracts of the literature of industrial hygiene. We believe that an almost unlimited amount of good can be done by a publication of this sort, if its contents be not made too exclusively technical and if efforts be made to extend its circulation among the employers of labor, and also among workmen.

**Natural Enemies of Mosquitoes.**—Dr. L. O. Howard, chief of the U. S. Bureau of Entomology, writing on his favorite theme, the mosquito, in a recent bulletin, reviews the subject of the natural enemies of this insect. Among fish, he mentions first the common goldfish and silverfish, which destroy mosquito larvae and should be put in artificial ponds. Top-minnows are great feeders on mosquito larvae, and certain species introduced from Texas and Hawaii have proved their value; while a small top-minnow of the genus *Girardinus*, known in Barbados as "millions," has been used successfully in other West India islands. Many predatory aquatic insects feed on mosquito larvae. Certain birds prey upon the adults, and bats also eat them. Many plants are popularly believed to keep away mosquitoes, among them being several species of eucalyptus, the castor-oil plant, the chinaberry tree, etc. Scientific observations have not confirmed the popular idea on this subject.

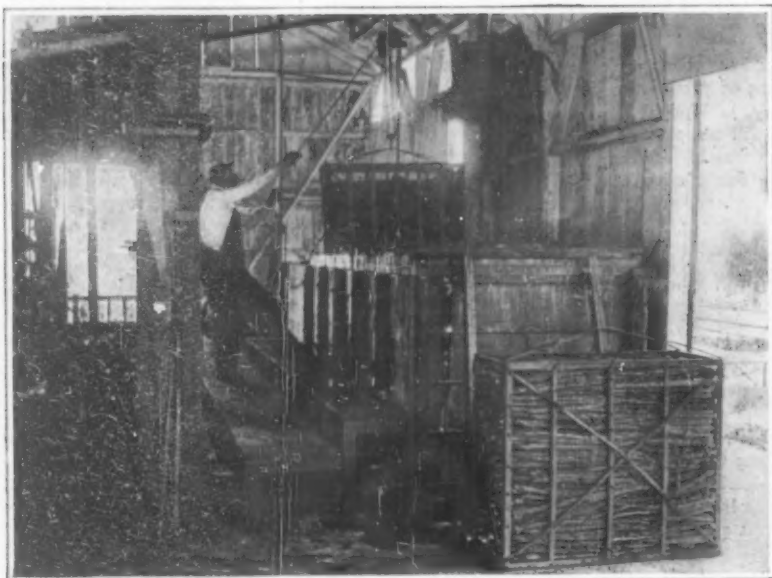
## Automobile

**Motoring in Venezuela.**—U. S. Consul F. A. Henry advises that there are about 300 automobiles in the Puerto Cabello district of Venezuela, chiefly five-passenger cars of American manufacture which sell at prices from 50 to 100 per cent higher than in the United States. It is also stated that while the use of motor trucks will probably increase in the future there are certain conditions which tend to restrict the growth of this trade. Among these are the scarcity of skilled automobile mechanics, the enormous prices asked for gasoline, even though it is produced in the country; the poor surface of the narrow roads and the low cost and inexpensive maintenance of pack animals, which are better suited to the many narrow paths and trails of the country.

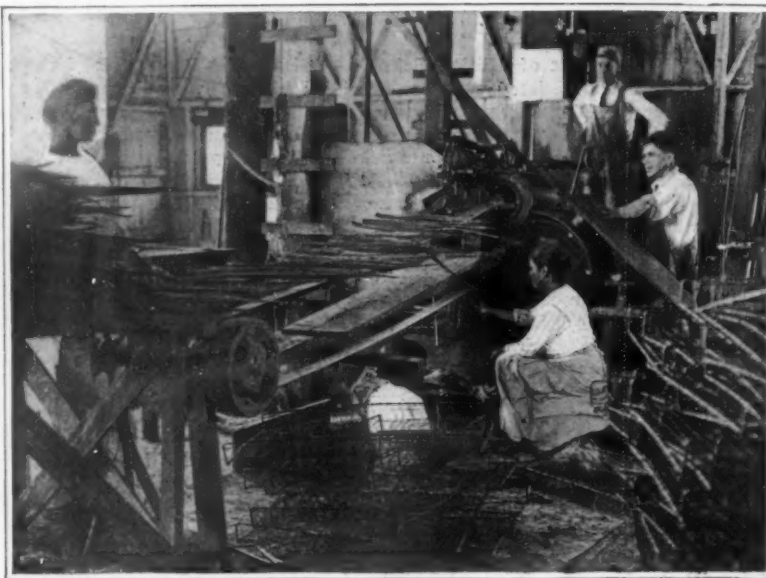
**Racing Engine of Stalled Car Futile.**—The slower a wheel turns, the more traction it has, so the common practice of racing the engine when the wheels get in sand or soft earth only aggravates the difficulty by causing the car to become more deeply mired. Racing the engine also shortens life of tires and results in avoidable depreciation of the power plant. With the wheels going at high speed it is impossible to get any traction, even if straw or twigs are placed beneath the treads, and tire chains will be slipped around idly. The effect is usually to dig a deep hole and increase the difficulty. The correct way is to pack straw, stones or brush beneath the wheels, use low gear and only speed the motor sufficiently to take the clutch without stalling. Above all things don't race the engine.

**Locomotives in South Africa.**—A contemporary states that owing to the high cost of operating the usual forms of motor truck in South Africa, a modification of the truck tractor is being used in a way that promises both cheap and efficient transport. Roads are very poor and during the rainy season are often impassable. The light railway is advocated as the solution and suitable motive power is believed to have been definitely discovered in a gasoline locotractor, a special form of machine intended to take the place of the locomotive on pioneer light railways. When the usual railroad system is followed, a ballasted bed and heavy rails are needed to carry a locomotive of usual construction and the railroad cost per mile is very high. The locotractor system uses load-carrying cars running wholly upon rails. The guiding portion of the locotractor also runs on the rails, but the driving wheels, shod with solid rubber tires, run on prepared strips of road metal on each side of the railway track and have greater traction, thus for a given horse-power and weight the hauling power is stated to be four times as great as with ordinary locomotives having driving wheels running on tracks.

**High Duty on American Automobiles.**—The explanation that a high duty on imported American automobiles is necessary to restrict importations as a protective step to maintain the present rate of exchange does not appear to be the true reason, but fear of American competition is the one that seems most reasonable to one who is familiar with the remarkable war record of our cars and trucks in European service. This was such as to create favorable comment on the part of the European public and many orders could now be booked for American cars from residents of both England and France. These had an opportunity to see how little the European prejudice against "cheap" American cars was founded on by first hand information gained by actual observation of our thousands of medium-priced cars and the service they rendered our army and the civilian auxiliary branches. It has recently been brought to the attention of automobile manufacturers in this country that a convention held in Paris decided to recommend the imposition of a tariff duty of 45 per cent against American products while the duty would only be 10 per cent on imports from European countries. While at the present time, imports of automobiles are prohibited in both England and France, these are necessary war measures and American industry had reason to hope that they would be discontinued after the industries of the countries involved had been changed from a war to a peace-time basis. It is fortunate that this congress of European manufacturers can do no more than make recommendations, but when one considers the present attitude of European peoples, it is feared that some sort of drastic legislation will result from this agitation to restrict American exports of automobiles.



Vats in which the leaves are boiled before separating the pulp and the fiber



Separator, which crushes the boiled leaves and frees the fiber from the pulp

## Binder Twine from the Desert

How a Use Has Been Found for an Utterly Useless Plant

By John L. Von Blon

HERETOFORE deemed worthless and on a par with the ugly cacti and other hispid growths of the waste places, the yucca, "Spanish bayonet" or "Spanish dagger" of southwestern America's desert and mountain regions is become a figure in the economic world. It promises to revolutionize the binder-twine industry; to be the source here at home of a highly important commodity which now has to be brought from other countries for manufacture—fiber. During the past season it entered into the hands that held millions of sheaves of our war harvest. In Los Angeles a plant of considerable proportions built up in a comparatively short time is successfully converting yucca spines into fiber of high quality, so good that only experts can distinguish it from the sisal product. It is equally tough and pliable and possibly excels in tensile strength.

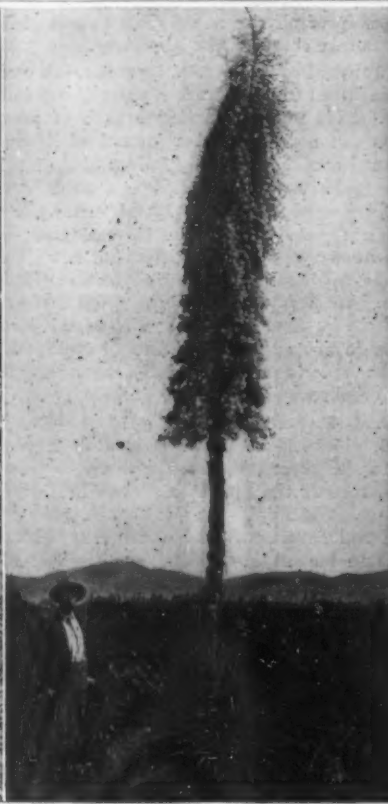
The unique mill is owned and operated by F. J. Bingham and A. G. Brown, who originated and developed

the interesting processes, partly secret, carried out there. After a long period of experimental activity they attained a practical basis 18 months ago and have since been steadily shipping 35 tons a month of their product to Chicago. They employ 50 men and women, about two-thirds of these in the field, and are arranging to erect a large plant on the desert in the vicinity of Victorville, Cal., in proximity to vast quantities of the raw material. Thirty-five tons of fiber is an infinitesimal proportion of the monthly consumption, but the industry is in its infancy. The field is immense and the "crop" unlimited. Already another Los Angeles concern contemplates a similar enterprise near Kingman, Ariz., and still others are taking hold. The base of our binder twine now is the sisal mainly from Yucatan. With it the fiber from the yucca has been mixed a year and a half by the heaviest manufacturer in the world.

Shipped in from the nearest available source the

spines, veritable bayonets as sharp as the finest needle and ranging from not under 22 to 40 inches in length, and tied in bundles of 25 pounds, are packed in large steel crates and subjected to a patented chemical boiling process in deep vats. This eliminates certain acids and renders the strong, stiff leaves soft and pliant. It requires but a short time. Then they are run through the decorticating machine, or separator, an intricate two-ton crushing and segregating mechanism with a semblance of human intelligence, which takes the fiber from the pulp. This contrivance is fed by a woman, a carrier taking up the leaves one by one, and the fiber being similarly delivered into another woman's hands at the opposite end. The operation appears slow and tedious but an average of more than two and a half tons of spines goes through in a day and the net yield is a little over a ton of fiber.

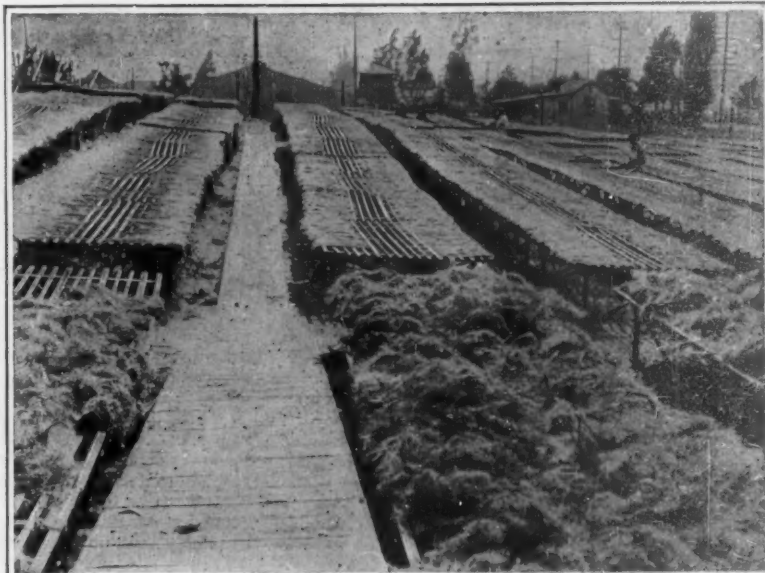
After leaving the separator the fiber is cleaned on



In the center a head of yucca 23 feet high in full bloom. At left, part of a 100-ton heap of heads on the way to the mill. At the right, the green bayonet or leaf and the finished fibre made from it



The final cleaning process in the preparation of yucca fiber



Drying racks with tons of fiber fresh from the separator

roller machines by woman operatives and then run on the outdoor drying racks for bleaching. Here Southern California sunshine is a most effective agency and a money-saver. It disposes of the moisture in a few hours, changes the color from black to tan, and the fiber is ready for the baler and the waiting freight car. The plant is electrically operated and requires little power. The help, with a few exceptions, is not necessarily expert. The investment approximates \$35,000.

There are about fifty-six varieties of yucca and four of these enter into the present compass of the fiber manufacturers. They differ widely in form. The leaves of one very common kind grow on large heads and these have been taken to the Los Angeles plant in great quantities and the spines cut off and utilized. The heads themselves, weighing from a few pounds up to nearly fifty, may be the nucleus of a paper-pulp industry of inestimable proportions and value. Experiments have proved that they make splendid paper stock.

A method of manufacture has been evolved and the early construction is planned of a

mill of appreciable capacity. These heads make excellent fuel, burning a long time and giving out intense heat, and about a hundred tons now on hand is being given the poor for that purpose. If this variety can ultimately

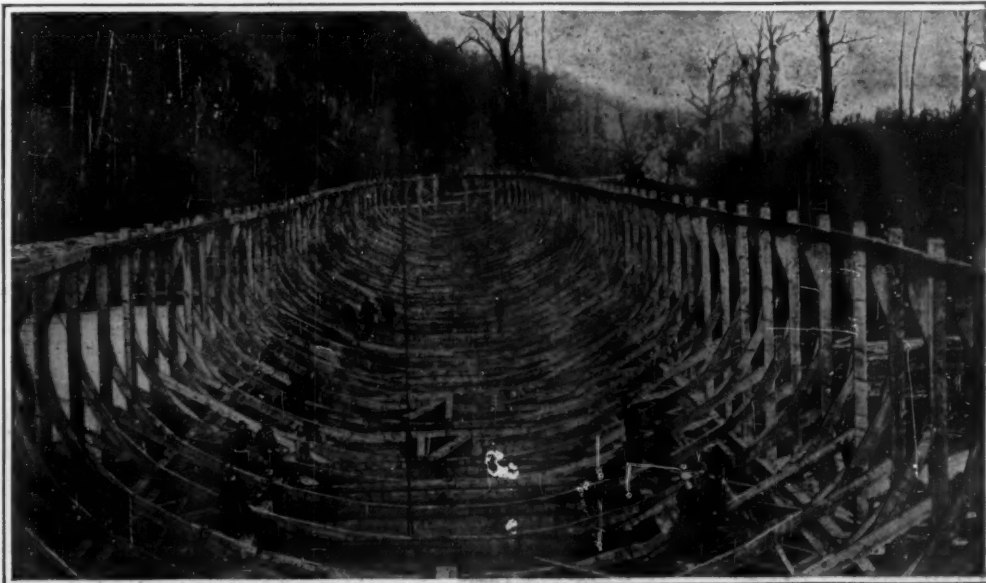
(Continued on page 97)

### How Log Rafts Are Put Together and Launched

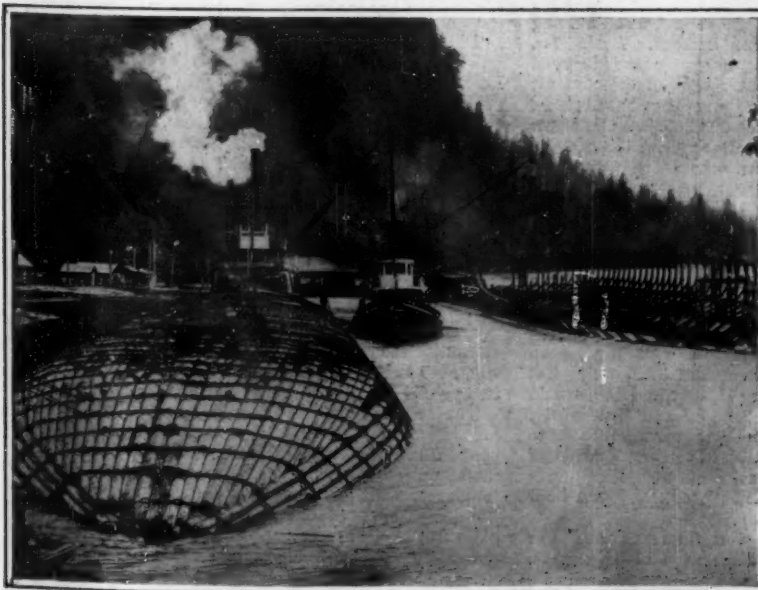
EVERYBODY has seen pictures, at least, if not originals, of the huge rafts of logs which are made up to effect the transportation of lumber from the forests to the mills. Sometimes these rafts sail down a big river like the Columbia, sometimes they are expected to undergo an ocean voyage like that from seaboard points of Oregon and Washington to San Francisco and other manufacturing centers. This manner of moving the raw lumber has been a familiar one for many years; but the number of rafts that have been floated throughout our Pacific Northwest has been tremendously increased during the past two years, as a result of the prodigious airplane program which we got under way.

There is nothing especially new in the picture of the raft itself, since its use is so much a standard feature of lumbering; but few of the laity, probably, have ever taken the trouble to wonder how these huge bundles of logs are put together. In the photographs reproduced on this page the secret is revealed; they are not built in the water at all, but, much

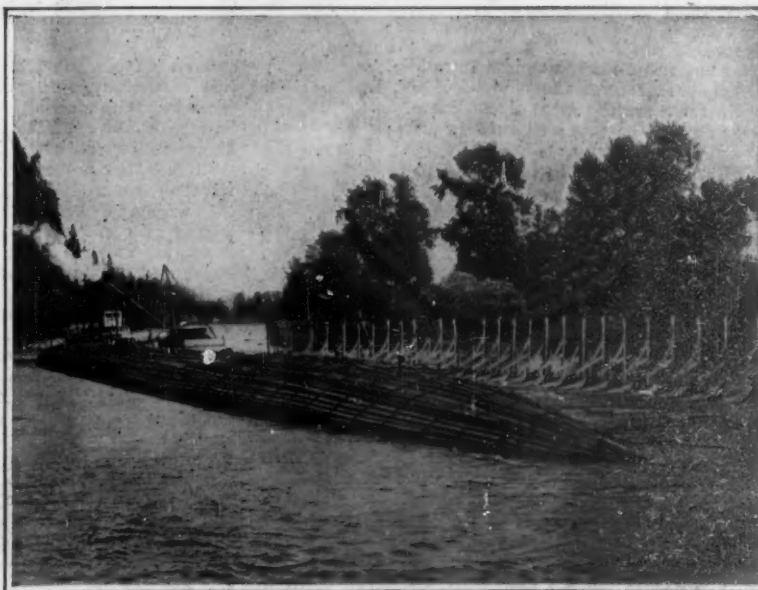
(Continued on page 97)



Building the cradle in which giant log rafts will be put together for the long trip down the coast to San Francisco



After a successful launch, the side of the cradle is replaced and work started at once on another raft



Just after the launching, showing the side of the cradle removed to make way for the sliding off of the raft

# The Freedom of the Skies

Some of the Problems That Will Have to Be Solved as the Human Race Takes to the Air

By Alexander McAdie, A. Lawrence Rotch Professor of Meteorology, Harvard University

ONE hears much today of the "freedom of the seas." To most of us, the questions in dispute seem to be largely academic and not of direct and immediate consequence. In this we are wrong, for the sea, up to the present era, has been the one great connecting link between men and nations; and that nation which has command of the sea has undoubted control of the world's commerce. But today, there is an upper sea, the medium in which men move and have their being. And the Great War brought home to men the value of a command of this, the sea of air.

The ancients dreamed of flight resembling that of the birds; but it was reserved for our age to witness these dreams made fact. The great Augustan poet who sang, 20 centuries ago, "Let them close all passages by land and sea, nevertheless the Heavens are open and through them we shall pass," would revise and elaborate his *Metamorphoses* if written now, in the light of what is daily accomplished by Liberty and Hispano-Suiza engines and Caproni and Handley-Page planes. His words, however, lend point to the one great feature of any discussion of the freedom of the skies, namely that here are no land-locked harbors, no boundaries, no neutral zones. The right of a nation with no coast of its own to access to the open sea, and the protection of its ships enroute, can not be raised, for all lands are air girt and every city is an open port. Switzerland not less than Britain may have an aerial base for her fleet if the nation so desires. And in describing the paths of the world's commerce a new term comes into use, the word *overcloud*, in the fullness of time to be as frequently met with as those overworked words, *oversea* and *overland*.

While there are no special boundaries in the ocean of air, there are rivers in the air just as there are rivers in the sea. Most of us have forgotten that charming description of one great river in the sea, the Gulf Stream, which Lieutenant Maury gave us years ago; and a few of us, even those whose college days do not antedate the war, can locate and describe other great rivers in the sea, such as the Kuro Siwo (the blue salt) or Japan Current, the Drake, Guinea and Labrador currents or even those smaller streams, the Davidson and Irmingen. For every big river in the sea there is a return or eddy current. Some day this complex circulation of the waters must be studied in relation to national development. It is conceivable that among the many questions connected with the freedom of the seas, there might be one dealing with the right of one nation to dam or hinder the full flow of some river in the ocean, to the detriment of another and distant nation. Some years ago there was a serious proposition to deflect the course of the Gulf Stream. While such proposals seem at the present time to be hardly beyond the imaginary stage, it would be foolish to forecast the impossibility of a successful outcome if such a gigantic engineering feat were ever to be attempted. These rivers of the sea determine the trade routes, the location of cities and the habitations of men. Of even greater importance are the rivers of the air. What the Gulf Stream and the Japan Current are to the mariner, the prevailing Westerlies are to the aviator. Reverse the flow of this mightiest of the rivers of the lower air, and California would be as bleak as Labrador and Labrador have the climate of the British Isles. Again there are the great rivers known as the Trades, not as might be supposed because of their relation to trade routes, but from an old English meaning of the word, steady, to blow trade meaning to blow steadily in one direction.

And there are also rivers in the air that flow intermittently, seasonal rivers or *monsoons*. In some parts of the world, the crops depend absolutely upon the duration of these seasonal air streams. They bring the clouds and the rain to thirsty lands; if they come early and continue long, the harvests are abundant and the year is a fat one. On the other hand, delay in the breaking of the monsoon means scanty harvests and a lean year, perhaps famine. It is a far, far flight of fancy to think that man shall ever be able to control the weather; but man has already cut canals and joined oceans and may some day undertake seriously to utilize the great rivers, in the sea, diverting a Gulf Stream or a Japan Current; and then with the ambition of Lucifer, he will attempt to deflect some river of the air, some rain-bearing wind. We have just had demonstrated the efficiency of a blockade of the sea; and all far-seeing men know that the ability of one great maritime power to close the sea and prevent the enemy from obtaining supplies and especially food, spelled victory.

Consider now what would happen to an enemy under the establishment of an air blockade, and still more deadly, suppose some means devised for depriving the foe of a supply of rain!

So, the existence of these great aerial rivers will make it desirable that at some future date the jurists of many nations meet together and consider questions dealing with the freedom of the air. Perhaps there will be legal definitions of the *aer liberum* and the *aer clausum*. Perhaps there will be a limit of 1,000 meters or so, to be regarded as territorial air, just as we have the three mile limit from the shore line before the high seas are reached. That certain jurisdiction will be claimed for the lower air levels is only natural. The war just ended exemplified for the first time in history the right of a neutral nation to claim as territory the air above. The neutral states had the right to close the air to passage by the planes or Zeppelins of the belligerents. The Allies respected this, while per contra Germany violated the neutrality of the smaller kingdoms, as it suited her convenience, her planes and dirigibles passing overhead in the dark, with none to gainsay or bid them pause.

Two great nations, now happily at one with regard to peace, once went to war to settle the seemingly academic question, "Is the deck of a vessel the territory of the nation?" Then they made a treaty of peace that contained no reference to the question at issue, which, half a century later, was settled by correspondence between our Secretary of State and a Minister of Foreign Affairs. Will there ever be differences of opinion regarding the right of search of airships?

The ships of air have one great advantage over the ships of the sea, they can change from one level to another. There are submarines it is true; but the commerce carrier for years to come will float on the surface. The largest transoceanic liner caught in the fog or in an ice-field can not rise even a scant 100 meters; but the overcloud flyer can pass lightly over the tallest berg or thickest base-born fog, to higher levels and sunshine.

Then there are the very small rivers of air, we might almost call them air brooks, known to man from the infancy of the race, as the winds. A century ago, these controlled commerce and navigation, since all ships were sailing vessels. The flow of the surface air was the prime mover. Fulton made the expansive power of water vapor or steam take the place of the wind and in time steam supplanted the pressure of the breeze. The steamboat is only 110 years old; and while there were earlier individual crossings, ocean navigation may be said to date from 1830. But coal now gives way to liquid fuel and this in turn to gas and while there is no chance of a return to wind power, it is true that the force of the wind becomes again a matter of much importance, for an airship moving at a normal speed of 45 meters per second or say 100 miles per hour gains 50 per cent in speed when traveling with a wind 22 metres per second, a wind velocity quite frequent at moderate elevations. The fastest steamship making 10 to 13 meters per second can only gain about 25 per cent of its speed when moving with the strongest tide or ocean current. Again if a steamship meets an adverse tide, her progress is delayed just so much, depending on the strength of the current; whereas when an airship encounters strong head winds, her pilot can rise or fall below the level of that particular air current and find a level in which the air will be moving with him and not against him. As these words are written there are laid on the desk the soundings for the day, morning and afternoon; and for this particular date and for so short a run as that from New York to Boston, it appears that the aerial mail northbound would have to take the stream not lower than 1,200 meters while the southbound mail would fly low and get the benefit of the northeast wind blowing about 10 meters per second. Assuming that the planes were identically powered and made 40 to 50 meters per second, the mail leaving Boston would reach New York in 1 hour and 37 minutes but the mail leaving New York flying at the same level would not reach Boston in less than 2 hours and 30 minutes. If, however, the pilot of the northbound mail chose to climb 3,000 meters he would have a southwest wind of equal strength to the northeast wind prevailing lower down and thus make the flight in practically one hour and a half.

Finally, we must consider the thousand and one questions connected with the disposition of passengers, crews and cargoes of the large airships—the real argosies—when overhauled and captured by aerial raiders. By

the use of proper parachute protectors, the passengers and crew might be thrown overboard and allowed to descend to terra firma, on the whole a much more humane proceeding than setting them adrift in lifeboats on the open sea.

And there will be developed, let us hope, a certain "chivalry of the air," any violation of which by nation or individual will properly be regarded as a crime against humanity. Indeed, it would seem that during the war, if we except the bombing of open towns and unfortified cities, the fighters of the air clearly recognized and practiced this, even as in former days the seamen of all nations upheld the chivalry of the sea.

## Preventing the Growth of Gray Cast Iron

A METHOD for the prevention of growth in gray cast iron was recently suggested before the British Iron and Steel Institute by a prominent Englishman.

He pointed out that the phenomenon of growth or expansion of gray cast iron when subjected to repeated heatings in an oxidizing atmosphere has been shown to be due to the increase in volume consequent on the internal oxidation of the various constituents by means of the gradual penetration of the oxidizing gases into the mass, and the primary cause is the presence of free graphite plates which permit the entry and penetration of these gases. Hence the removal of the free graphite from the exterior surface layers would appear to be an ideal method of prevention, amounting to the production of a skin or "case" of decarbonized material. This method was successfully employed in the case of gray cast iron water pipe, which was repeatedly maintained at a temperature in the region of 800 and 900 degrees Centigrade alternately for a considerable period in a strongly oxidizing furnace atmosphere. The pipe was covered with a thick scale of rust (hydrated ferric oxide), which is considered to have contributed largely to the decarbonization. In other experiments the author met with success by prolonged annealing in this material.

This method, the author suggested, should find application in the protection from growth of dies and permanent molds for iron and non-ferrous metals, and of valve seatings and guides in internal combustion engines. He has several permanent molds that have been protected by annealing at 900 to 950 degrees in ordinary brown rust (oxide of iron) for 72 hours, and improved results have been obtained by raising the annealing temperature to 975-1,000 degrees, though in these cases troubles have been experienced through distortion.

## A New Process for Measuring the Expansion of Liquids

WHEN a liquid is heated in the vessel which contains it there is an apparent expansion which varies with the nature of the vessel, so that in order to determine the absolute expansion a double measurement must be made, the apparent expansion of the fluid being modified by the previous measurement of expansion of the container.

The *Revue de Chimie Industrielle* gives the following report of a much more direct process evolved by M. Jean Escard which requires only one operation.

He makes use of an apparatus composed of two concentric cylindrical containers, the inner one of copper and the outer of glass. The inner container has a volume which is exactly half that of the outer one. But it is a known fact that the coefficient of expansion of copper is 0.000,0172 while that of glass is only 0.000,0086, i. e., exactly half. Consequently when the two containers are heated at the same time there is no change in the volume of the space between them, since the inner one has an expansion which is double that of the outer vessel having a double volume. Thanks to this ingenious compensation, a single reading enables us to calculate the coefficient of expansion of any liquid whatever occupying the space comprised between the two vessels.

The combination is placed in a water-bath which is heated from the outside. This has a ring-shaped cover containing two holes, in one of which is inserted a thermometer which fits tightly and which indicates the temperature attained by the liquid being tested. In the other hole is placed a graduated tube welded to the glass and having a very narrow channel so as to make it extremely sensitive. The liquid expands into this, and its expansion is measured directly and without significant error.

## Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

### Another Problem in Driveway Lighting

To the Editor of the SCIENTIFIC AMERICAN:

Have read in your issue of May 10th, 1919, an article by Evans J. Edwards entitled "Lighting An Automobile Driveway."

I had a problem in building my garage and driveway which at first seemed a difficult one as the land adjoining mine was about two feet lower than mine and there was only seven feet of space between the line and steps.

I am sending you sketches and a picture showing how I lighted the driveway and also the track to keep the automobile from running off the roadway after it was once in the track.

I located outdoor reflector lights over the doors at A and B shown on the plan which are controlled independently by buttons at each place: When leaving the house I press button at A for light A which lights the walk and track, then back either one of the cars out and into the track until the car is opposite light A then I put out the light as the car being in the track will then back straight to the street.

When coming in the headlights of course are sufficient to light the car into the garage, but before putting them out, I light B and when I get to door of house at A press button and put out light B.

I had to limit myself to a track for one wheel only as it was necessary to have a flat walk to the back yard. It has worked fine and been adopted by others.

Have drawn a sketch of section of this track for the benefit of any one who might wish to make use of it. The four-inch wall could be left off unless one wanted an extra factor of safety.

New Haven, Conn.

### Swamp Land in Florida

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of May 24th, R. W. Storrs of De Funiak Springs seems somewhat incredulous as to 19 million acres of swamp land in Florida. The Commissioner of the General Land Office and you in your editorial capacity seem likewise incredulous. Perhaps I can help all these worthy gentlemen out.

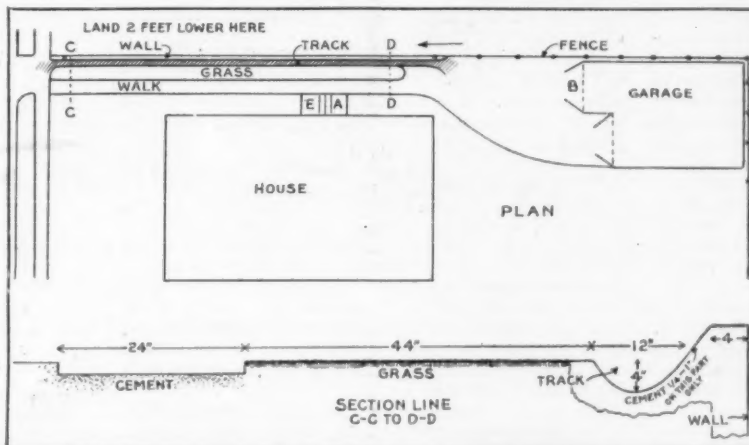
First: What is overflowed land? Is it only such land as is under water 12 months in the year? I think that is certainly an extreme position, nor do I believe that the Swamp Land Act of September 28th, 1850, had such an interpretation in view. Rather this term should indicate lands that for a portion of the year are under water, and that cannot be farmed without drainage.

Now for conditions; and that you may know whether I am competent to have an opinion I will say I have been a resident of Florida for more than 35 years. For several years my duties took me all over the state by all sorts of conveyances. I have covered the ground from Pensacola to Key West. I am an all-year-round resident, not for the winter only; I think I know Florida soil and Florida climate and I am prepared to believe that 19-million story. The greatest elevation in the state is less than 400 feet above sea level, and this ground is backbone down the center of the state and comparatively narrow. The wide coastal plains of each side of this are only a few feet above tidewater. So you will readily see that there are no splashing waterfalls. The streams are slow and sluggish and drainage slow.

This is one of the conditions. Then we have about 60 inches rainfall. This takes the form of light showers from October to June, then the rainy season sets in—usually by June 15th—and you can count on rain every afternoon. When this has gone on for say six weeks, and then you get one rainfall of say eight inches, with streams all bank full and every acre oozing moisture, I think you will decide there is some overflowed land in Florida.

I live on the south side of Polk County. Little Paine's Creek runs through my place. There is hardly a March, April or May when a good healthy ox could not drink up the creek. Yet I have seen that same creek for weeks at a time out of its banks and a quarter-mile wide; and if it had not been for the timber a Mississippi River steamboat could have navigated the stream.

Then the lakes, even on the high ground, to any experienced eye show a wide difference in the level between the dry season and the wet. To illustrate, on one of my trips I met a man who had lived not far from here and he was glad to see some one from the old neighborhood. We stood under his house talking, without a thought of striking our heads—and I am so close to six feet that the shortage is not worth arguing about. I asked him "What made you set your house so high?" He said: "Let's go upstairs and see"; so we went up the steps.



A seven-foot alley with a two-foot drop beyond created a problem in path construction and lighting here. The plan shows how it was solved, and the sectional view shows the form of the roadway between CC and DD

He opened the door and we walked in; he pointed to the wall, and there was the water line, at least 18 inches above the floor. "You see, I did not set it high enough," he remarked.

At Hickory Bluff in the winter you will probably find the landing three feet above water. But if you go there in July or August, it will likely be under water by a foot or maybe three feet. Buffalo Bluff is just the same. You need not look for any steep precipitous walls of granite in Florida, for they are not here. I was asked to go and look at a tract of land in a vicinity where I had once before been, in December. It was somewhat



The roadway of the above plan

around August when I revisited the place; I drove 12 miles to get there, and I honestly question that there was three miles of the route that was not from two inches to two feet under water. I went to see 100 acres of land in Lee County in which I was interested. This was in December, and there were 12 acres in cane. The next August my man wrote to me that there was about 400 square feet above water, the rest of the tract being submerged by anywhere from six inches to six feet.

I have known the rainy season to begin before May 19th or to be delayed in its arrival beyond June 19th. This year it began May 26th, and we have had rain every day; the other day two inches in about an hour. Let this continue until September 15th, and that is what you can count on, and there will be a lot of overflowed land in Florida.

### The "Savannah"

To the Editor of the SCIENTIFIC AMERICAN:

Your article of May 17th describing the "Savannah" as the pioneer trans-Atlantic type of steamer, might have been supplemented by the statement that though President Monroe did not succeed in having her bought by the Government, he, or some bureaucrat, did succeed in so stamping the "Savannah" type upon the imaginations of our naval designers that it lasted well into the beginnings of our modern navy.

All the celebrated "White Squadron" ships designed in the '80s were obviously, in the minds of responsible officials, sailing ships with auxiliary steam power plants. The famous battleship "Maine" and the quaint old "Texas" carried masts, yards and canvas, though in a typhoon some one estimated their sailing speed at three knots an hour, which was probably excessive. They were solemnly rated as "steam frigates."

The obsession of steam supplementing sail power which thus came to the front in the '80s is curious even for Washington official psychology, in view of the number and variety of warships put into action by both sides in the Civil War in which steam was the sole power and amply demonstrated itself.

It is interesting that present-day warships which include the lessons of the Great War, are reviving several Civil War types, jumping over the steam-and-sail ideas of the '80s and nearly '90s, exactly as the designers of 30 years ago skipped the Civil War lessons and harked back to the old "Savannah."

LEONARD D. COMPTON.

Oakland, Cal.

### Channel Tunnels

To the Editor of the SCIENTIFIC AMERICAN:

A short paragraph in May 17th declares the improbability of a tunnel under Straits of Gibraltar under a depth of water of 1,200 feet. Last January 16th the *Youth's Companion* had an article about the same tunnel but his depth was for 2,500 feet. I did not know then that the depth was wrong but I wrote him that while I was not an engineer I thought the tunnel not likely to mature as the great depth would require such long approaching tunnels to get commercial grades as to make the cost prohibitory and that a train ferry service would give the same results for a tithe of cost of a tunnel and in a few months' time.

Reading your article a few weeks back on the Dover Channel Tunnel, it occurred to me that the ventilation would be made more safe and secure by equipping each train with its own supply of compressed air same as a submarine does.

JOHN G. STEEN.

Philadelphia, Pa.

### Plague of Bookworms

To the Editor of the SCIENTIFIC AMERICAN:

As an old subscriber to your paper, I take the liberty of asking you how to get rid of the bookworm in my library. I have tried camphor, naphthalin and formaline without any success, and am compelled to clean and shake with the greatest care every once in a while all the books, in order not to lose them altogether. While presuming that originally they were imported by me in some 100-200 years old works on Brazil, by comparison with the damage done to libraries of some friends it seems to me that one animal producing many tiny little holes is a native attacking also modern works. In the most curious manner they usually get hold of the cover and first pages of the book, then unexpectedly, after skipping many pages again the middle, etc., etc. They objected to Mr. Roosevelt's "Through the Brazilian Wilderness" and Mr. Wilson's "History of the American Nation," as I find but very few small holes; but some interesting novels of Mrs. Humphrey Ward and others, "Trilby," Lorimer's "Letters of An Old Merchant to His Son," etc., struck their fancy and are in such a bad condition as to compel me soon to discharge them altogether.

So far I have been unable to get here any information on the matter and would be very much obliged for your advice, for which please to accept my thanks.

GEORGE ROSENHEIM.

P. O. Box, 296, Santos, Brazil.

[Perhaps some of our readers can suggest a remedy for the trouble which this correspondent is having. If so, please write to him directly.—EDITOR.]



## The First Round-Trip Trans-Atlantic Airship

Further Details of the R-34 and Its Return Flight from  
Long Island to the British Isles

**BRILLIANT** achievements and rapid strides in scientific and inventive endeavor have dulled our sense of true appreciation. Only yesterday, the trans-Atlantic flight was dreamed of as a wonderful undertaking, fraught with grave dangers for the pioneer aerial navigators of the ocean passage. It stirred one's imagination. Yet the Atlantic has been crossed by aircraft—crossed three times within the past three months, and by both the lighter-than-air and the heavier-than-air types. And, with our blunted sense of appreciation as a result of five years of marvelous advance in aeronautics, we take the flights as a matter of course, to be forgotten as soon as we lay aside the daily newspaper or turn from the animated screen newspaper of the motion-picture theater.

To those familiar with aeronautical development the flight of the British dirigible R-34 is truly marvelous. In last week's issue there appeared an account of the R-34's flight from Scotland to the United States, and the arrangements made to receive and care for the big airship while resting at Roosevelt Field, Long Island, but a short distance out of New York City. Since then the R-34 has departed from our shores and returned to Pulham, England, after a flight perhaps more remarkable than the westward one which brought it to America. Thus, within the short space of two weeks, the R-34 has made the round trip between Great Britain and the United States without untoward incident, and with a precision that augurs well for the commercial dirigible of the immediate future.

The return flight of the R-34 was made in about 75 hours as compared with 108 hours for the westward trip. Obviously, the wind was favorable for the eastbound trip; indeed, Major Scott reported that the dirigible covered 800 miles in the first eight hours, indicating a favorable wind of 40 miles an hour or more. Some trouble was experienced with the engines, one of which broke down entirely. Because of the favorable winds, however, the R-34 got along with the remaining four engines.

Thanks to the courtesy of Captain Samuel T. Moore, commander of the balloon troop helping care for the trans-Atlantic airship, additional details regarding the R-34 are now available, particularly those having to do with the interior construction and appointments.

The forward gondola of this monster airship is the navigator's office and it is from this that the ship is controlled through speaking tubes, electric bells, and signals. The steering gear is also controlled from this gondola, as well as the rudder. On the side of this cabin are "elevator wheels," which control the elevators for changing the altitude when necessary. There is a table in the navigator's office on which charts are made while a flight is in progress. Many scientific instruments are on it, as well as the controller for the radio station.

The rear end of the forward gondola is arranged as an engine room for a single engine. Amidships, there are two gondolas each with a single engine, while the rear gondola contains two engines, either of which can be connected with the rear propeller. Three or four engines are operated in the course of a normal flight, but if serious winds are encountered, the entire engine power is used. Ordinarily, the engine not in use is over-

hauled and cleaned while in flight. Two men work at the engines during flight, one man operating and the other oiling.

Inside the huge envelope of the R-34 there is a deck or "catwalk" just 600 feet long and very narrow, covered with linoleum. It is not difficult for a man to balance himself as he walks along this deck, but it would be difficult for two men to walk it.

There are 18 hydrogen compartments inside the shell. Nine of them have automatic valves, while the other nine are equipped with hand valves. The pressure of the hydrogen is not constant but varies according to atmospheric conditions, with heat causing an expansion and cold contraction. This is regulated by the valves. If the valves should get stuck, something might happen. So an indicator is provided for reading the pressure in the hydrogen bags, and in the event of the valves jamming while the pressure continues to increase, the crew have to decide on jumping for their lives or landing the ship in the minimum time.

The 18 hydrogen bags are made of goldbeater's skin,

is put in these emergency bags in accordance with the atmospheric conditions. They carry ballast weighing from 500 to 3,000 pounds. To prevent the water from freezing at temperatures encountered in the higher altitudes, a certain quantity of alcohol is added.

There are three tanks of drinking water and one reserve tank containing distilled water, used in case of a shortage of drinking water. On the westbound trip the men were limited to a pint of water a day toward the end of the journey.

The dining room is in the center of the ship, the only place where the deck is wide. It is about 20 feet long and 8 feet wide. There are three tables on hinges fastened to the framework, the same as on ocean liners. The officers and the men use the same dining room. The food is already prepared but the men could cook if they wanted to by means of an electric stove in a gondola. Another means of cooking is by means of the engine exhaust. The pantry is small, approximately two by four by eight.

The sleeping quarters are not very comfortable. Crew sleep in light hammocks suspended from the framework. There are about ten hammocks, which are woven from Italian hemp. There is not much feeling of stability. If a man fell out of one, he would fall through the fabric and out into the clouds. One cannot get a good, deep, untroubled slumber.

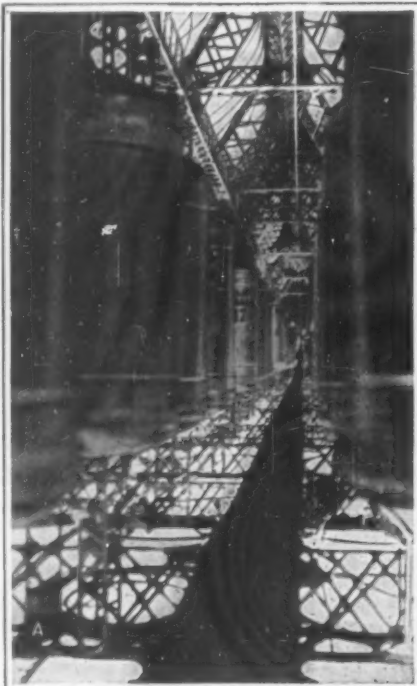
At the extreme end of the envelope there are no gas compartments—that is, for about 25 feet from the bow and from the tail there is a vacant space. There are only two stationary electric lights inside the envelope, making it necessary for the men to carry hand flashlights.

The cockpits fore and aft are equipped with heliographs. The observer is not comfortable. He is compelled to stand upon an aluminum ladder with his head above the ship. The extra clothes carried by the crew are strapped to the side of the envelope. The crew of the R-34 brought only their dress uniforms with them on their journey as extra clothing.

Running along the deck inside the envelope are the parachutes and life belts. These things are kept in canvas containers. The life belts are inflated with air. They go around the chest, and when wrapped up look like a bundle of clothes. Both the parachutes and life-belts are always available. If over land the men are forced to leave the ship, the parachutes might save them, while if over the sea the parachutes and life-belts would both be used and might possibly save them.

The accompanying illustration show life on board the R-34 while over mid-ocean on the westbound trip, being in the form of snapshots made by a member of the crew.

All in all, of course, the R-34 is a converted fighting craft. The large dirigibles which Great Britain is now constructing will be of such lifting capacity as to permit of greater comforts than are found aboard the R-34, which is already declared obsolete and somewhat unfit for a protracted flight like the trans-Atlantic passage. Which means, of course, that all the more credit is due Major Scott and his men for their wonderful round trip flight across the Atlantic Ocean.



Interior views of R-34 during the westbound trip: (A) is the deck or "catwalk" along the bottom of the envelope; (B) shows the navigator's quarters while over the mid-Atlantic; (C) shows the activities of the cook



which is the intestines of calves. The final inflation—that is, the loading of gasoline and hydrogen—takes place at the minimum temperature after the sun goes down. Flying over a warm city causes expansion, and over the sea, where it is cold, the bag is caused to contract. On the westbound trip, while flying over the ice floes around Newfoundland, there was a contraction of 40 per cent.

When the machine starts to rise and the guy ropes are thrown off, it rises until it finds its equilibrium. It may be 500 and then it may be 3,000 feet. When equilibrium is attained, the motors start. Meanwhile the wind carries the airship wherever it pleases. That is the reason why in most instances a start is made between midnight and dawn, when there is the least wind.

There are 81 tanks on board the R-34, containing the fuel. These tanks weigh approximately 500 pounds each. The capacity of each is 70 gallons. Sixteen of these tanks are fixed to the framework. The others are called "slip tanks" and have double functions, acting at times as ballast. The water ballast is carried in canvas containers—that is, four forward and four aft. The water

### Why Hawker Failed

By James L. Breeze, Jr., Lt. U. S. N. R. F., Chief Engineer of the NC-4

THE day the crew of the NC-4 arrived in London, we were invited out to Graham White's airdrome at Hendon, to see some stunt flying and to inspect some of the newer types of English machines. While out there I met Mr. Hawker and being particularly interested in the engineering details in connection with his recent flight, I got him to tell me the exact nature of the trouble he had had. His experience was typical of the kind of trouble that occurs in projects of this kind, when our regular equipment is to be stressed a little beyond its usual capacity, as for races or endurance runs. At such times we try to forecast all the possible contingencies; put in extra devices to take care of them, and then, too often, get no opportunity to test these out till the real event comes off. Then the unexpected occurs.

Here is what happened.

By referring to the diagram, the general scheme of his main and auxiliary water system is clear. His regular water system is the same as used on automobiles—a rotary pump, sucking the water from the bottom of the radiator and forcing it through the motor, finally discharging into the top of the radiator—except that he interposed a strainer between the bottom of the radiator and the pump. The auxiliary system comprised a reserve tank in the upper wing, with a small pipe A leading to the pipe discharging into the radiator. This system had been flown and worked well; but at the eleventh hour, the thermometer being down near the freezing point, it was feared that the water in the reserve tank might freeze; so a pipe B was added in order to keep a small circulation through this system, and thus keep it warm.

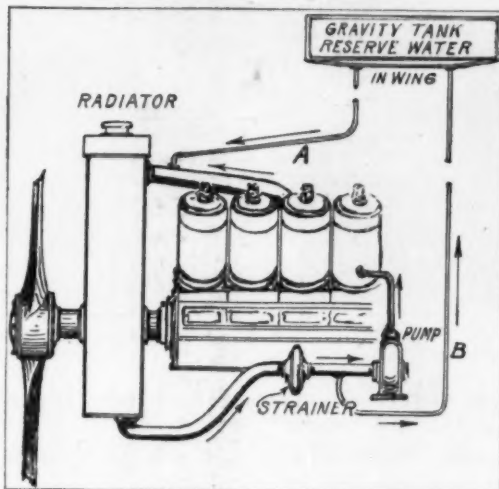
Here is what happened. The strainer became partially clogged up, thus causing a heavier suction than had been estimated and causing a rapid flow around through A and B, and thus short-circuiting the radiator and boiling the water away. This continued until all the reserve water boiled away. After that, the pipe B acted as a vent in the line, breaking the suction, and so reducing the capacity of the pump that not enough water was pumped through to keep the motor below the boiling point. So, little by little, all the water was being boiled away.

When Hawker realized this, he communicated with Commander Grieve, who took a course back over the main steamship lane. After zigzagging over this lane for a couple of hours, they sighted a ship and landed nearby.

It was some such detail as this that I was most worried about in making the transatlantic flight, and be it said, to the Navy's credit, that absolutely nothing was sanctioned for this trip unless it had been proved out in actual service. Our auxiliary water system, for instance, had been tested out on three boats flying from Philadelphia to Pensacola, besides being regular equipment in the experimental NC type planes. But even with the greatest care possible not to use new devices or combination of devices, it is difficult to keep them from creeping in at the last moment. Indeed, one of the greatest risks an engineer ever has is to try to overcome some known difficulty by an untried scheme which looks all right on paper. But if you want to get there every time, don't do it.

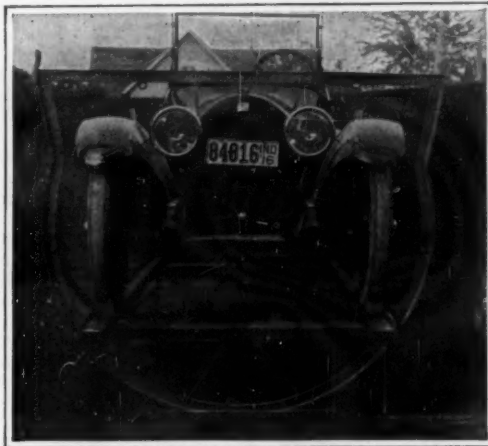
### Getting Away from Getting Under

EVERYBODY with extensive automobiling experience has at one time or another been confronted by a situation in which he has had to effect repairs to the



Schematic sketch showing safety water supply device which caused Hawker's engine failure

parts of the mechanism located under the car. This has always meant scrambling beneath the car and lying on one's back to work in a very awkward position, with grease and other things falling on one's face and even in one's eyes. This is apparently not to be avoided when repairs of this nature have to be made on the road; but when it happens in the garage it seems that there should be some substitute for the good old game of get



An automobile in position in the cradle ready to be tilted for work beneath the car

out and get under. To be sure, the pit is found in an occasional repair establishment; but this has to go in when the garage is built or its cost is excessive, and it is only a half-way relief. There would seem to be a wide field for some simple apparatus that would enable a workman to get at the under side of the car.

Such a device, invented by L. C. Nicolson of Alexandria, Ind., is now on the market; and we illustrate it here and on our cover. It will be seen that it consists

simply of a cradle into which the car can be run and in which it can then be tilted to any desired angle. It is very plain from one of our pictures showing the outfit in action that in the last-named respect it is far superior to any pit or elevated track. No longer is it necessary to work above one's head in tinkering with the bottom of the disabled car; we can turn the car to any convenient angle and so work at it from the most advantageous position. If we happen to want it horizontal we may have it so, with the added convenience that we are then able to work at it from above, instead of breaking arms and neck to work from below; but if we want it some other way we can have it so too.

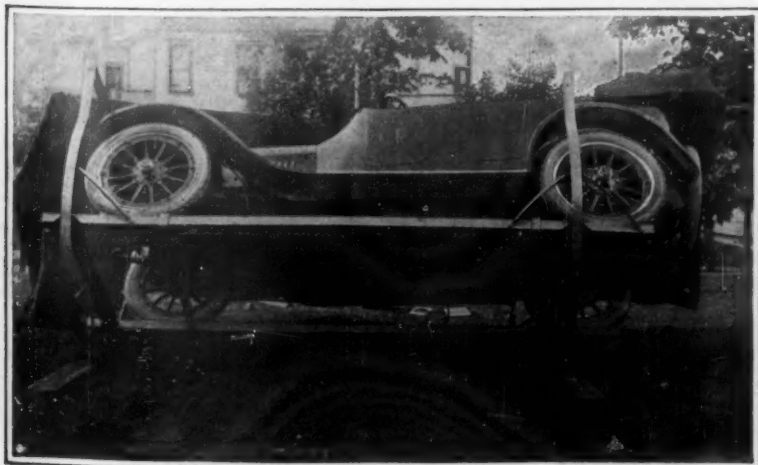
The photographs show so well the construction of the cradle that description seems almost superfluous. The track on which the circular member rolls should be noted, as well as the chain and sprocket by means of which this rotation is accomplished (best seen at the right of our third picture). The car is run upon the longitudinal tracks by means of skids or an inclined runway, and is held in position against the rolling by chains which pass about the wheels and make them fast to these tracks.

### The Current Supplement

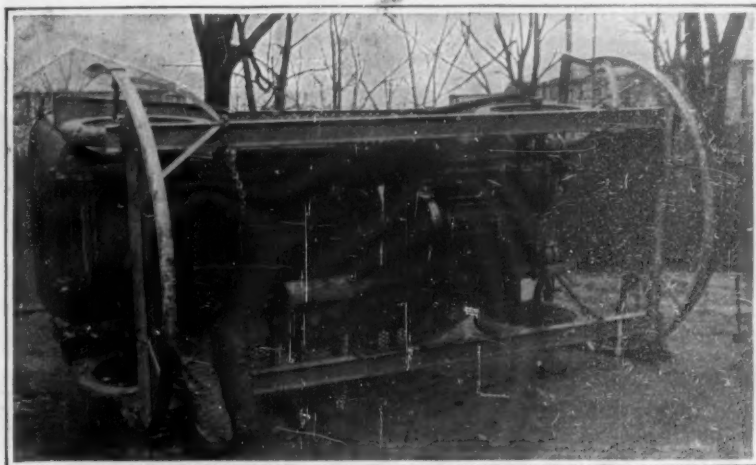
UNFORTUNATE delays have retarded the appearance of the second article in the series on wireless telegraphy, but the SCIENTIFIC AMERICAN SUPPLEMENT No. 2273, for July 26th, 1919, is richer by containing this contribution, *Experimental Wireless Telegraphy and Telephony*, wherein is discussed with a wealth of illustration the various forms of aërials, submerged antennae, and other devices convenient for the economical use of experimenters in this fascinating work. Another fascinating and most tangible sort of study is that of the molecular structure of *Soap Bubbles and Films*, discussed under that title by the French physicist, Perrin. His patient manipulations have yielded good evidence of the number of one-molecule layers that go to make up these delicate, iridescent membranes. An interesting article illustrates the different varieties of that ancient plant *Sorghum* whose whole body finds innumerable uses and has been employed by man for food, drink, sugar, broom, paper, etc., since the prehistoric days of African civilization. The final chapter of the victory of "Cupping" vs. "Boxing" relates how the student of pure science finally solved the problem of making the humane "cupping" system of the turpentine orchard the better money-maker for the practical man from the very start. The paper on *Recent Researches on Cholera* is also concluded. Valuable papers also expound *Hardness Tests for Metals*, the *Micrography of Aluminum*, and *Effect of Speed on Trim of Ships*. Among the shorter articles the following may be particularly mentioned: *New Process for Making Neutral Sulfate of Ammonia*, and an interesting sketch of *Sir William Crookes*. There are a number of photographs illustrating a brief sketch on *How Leather Is Prepared from Hides*.

### The Smokeless Power Grain

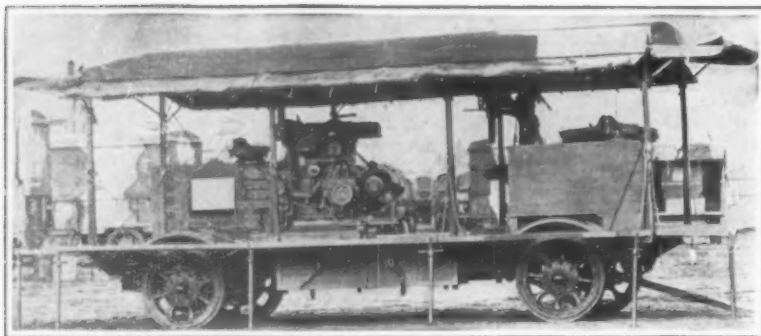
THE size and shape of the powder grain is based on the fact that when smokeless powder is ignited, it burns only on the surface. The larger the exposed surface is, the faster the grain burns. In order to give cannon powder a larger burning surface, the grains are pierced through with seven holes. When a grain is ignited, it burns not only on its outside surface, but also on the inside surface of these holes. As the outside of the grain burns away, the surface diminishes, but as the inside surface of the holes burn, the surface increases. These two factors may be made to balance.



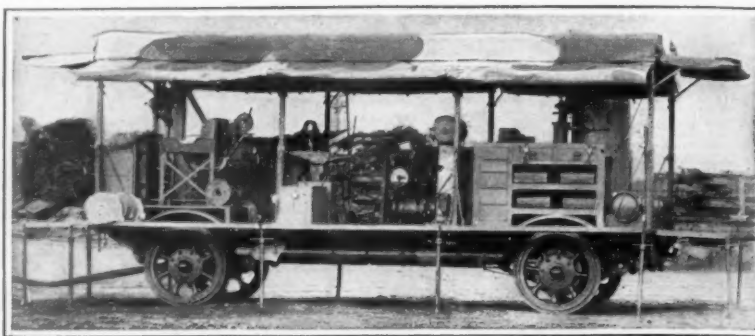
Starting to roll an automobile over for repairs beneath it



Working at an automobile from a position of unaccustomed convenience



On this trailer are mounted a 16-inch shaper and a 22 $\frac{1}{2}$ -inch drill press



Four-ton trailer with welding and cutting apparatus and blacksmith shop

## Keeping the Big Guns at the Front Effective

The Mobile Repair Shops of the U. S. Army Ordnance Department

By Herbert T. Wade, Captain, Ordnance Section, Officers Reserve Corps, U. S. Army

WHEN an Ordnance Repair Shop is able to take captured guns and put them in condition to be used against their former owners as they retreat, such an achievement would seem to entitle the mechanical part of an army to rank but little after the actual combat troops. This was the record of the 2d Mobile Ordnance Repair Shop on the Soissons front when its personnel made ready for action against the retreating Germans 28 cannon captured or abandoned, and ranging from 77 mm. to 210 mm. guns. Similarly the mobile ordnance repair shop attached to the 35th Division had a record of having no piece of artillery out of action longer than five minutes during the Argonne drive. This was accomplished, and especially during the battle of September 26th-October 1st, by pushing the mobile ordnance repair shop up to the very battery position and keeping in service and good condition the artillery in action. In fact such work enabled the American Army to have 97 guns on the firing line to three out of action, and contributed in no small measure to the efficient execution of the artillery program.

Now while this was the achievement of the skilled machinist personnel of these ordnance machine shops and their officers, hastily but efficiently trained from the best of the mechanical engineers and younger superintendents of American plants, it was made possible by the extraordinarily complete and ingenious equipment which had been developed back in the United States. These traveling machine shops, some of which are shown in the illustrations, were the result of peculiar army conditions and the resourcefulness of motor truck and machine tool makers.

Whatever may have been the lack of preparedness of the United States Army as regards arms and munitions at the outset of the war, once the huge ordnance program was put under way, there was not the slightest delay in providing equipment to maintain at highest

possible efficiency the artillery, motor vehicles and other appliances at or near the firing line. It was realized that battles might be won or lost by the number of guns ready at any time to function with maximum effect. Accordingly the Ordnance Department, along with the construction of artillery, organized a comprehensive scheme whereby the guns, howitzers, and mortars always would be attended by ample facilities for the immediate repair of greater or less mishaps. In this way was obviated the loss of valuable service hours occasioned by withdrawal of matériel to permanent base ordnance shops at the rear and the attendant overtaxing of road or rail transportation. These facilities were developed in the United States Army to a degree beyond that of other services, and its mobile ordnance repair shops represented in each case quite a substantial machine shop, albeit divided into a number of units mounted on motor trucks or trailers.

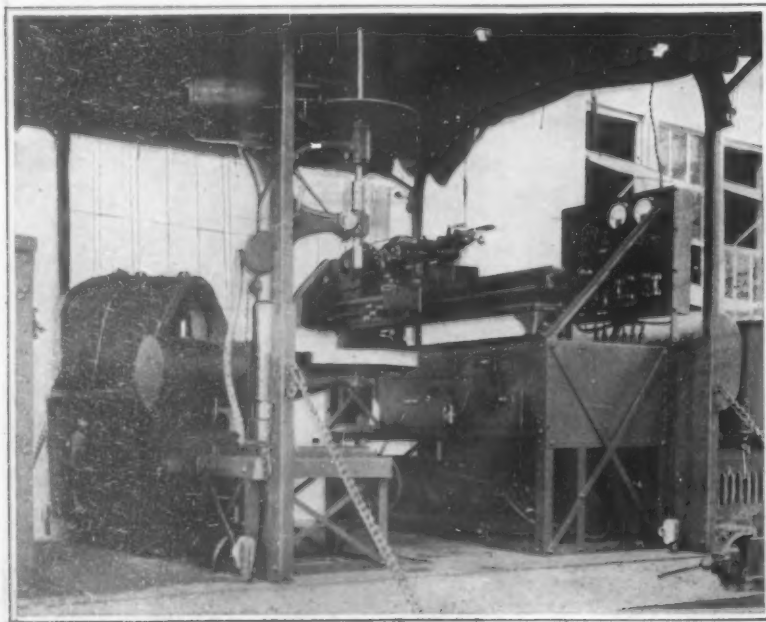
The idea itself was no new one for the American Army. In the operations on the Mexican border the ordnance and artillery officers realized that there must be available facilities for the repair of the small arms and machine guns and equipment as well as light guns and howitzers, and particularly for the motor trucks and tractors then beginning to be used.

The first suggestion for mounting an ordnance repair shop on a motor truck or trailer was made on August 11th, 1916, by Captain (now Colonel) James L. Walsh, Ordnance Department, U. S. A., Division Ordnance Officer of General Pershing's expedition into Mexico, who recommended an experimental train of mobile shops equipped for repairs to (a) small arms and machine guns, (b) harness and saddlery, and (c) personal equipment. This plan received the approval of Lieut.-Col. C. C. Williams, Ordnance Department, U. S. Army, Department Ordnance Officer of the Southern Department (now Major-General, Chief of Ordnance). Likewise in 1916 it was

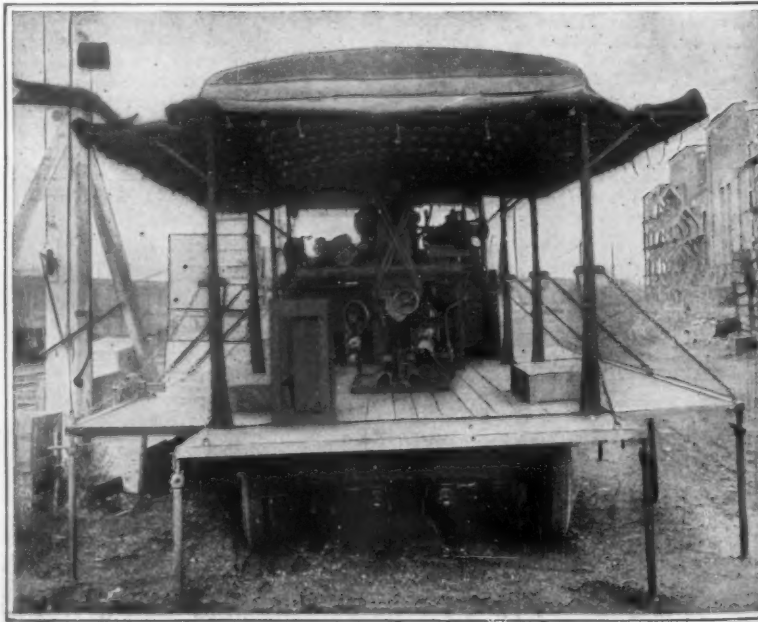
realized that the shops of the divisional ordnance depots, first prescribed in 1908, should be mobile.

Experiments and studies made on the Border and at Rock Island Arsenal led to important developments and innovations available when the United States entered the war. All of this was along the ordinary lines of the American service, but the ideas needed considerable enlargement as the European war progressed. Mechanical traction and mobile mounts were applied to artillery of such size as never before had been fired except from permanent emplacements, with mechanical devices larger and more complex than ever before had been attempted with field artillery. All of the guns and howitzers with their breech, recoil, and training mechanism, while robust in construction, nevertheless had parts accurately fitted and of such delicacy that failure either in some adjustment or element was possible and might put the piece out of commission, which an available spare part replacement or repair would prevent. So supplies and spare parts, lathes, drill presses, milling machines, shapers, oxyacetylene welding and cutting outfits, riveters, forges, and in short all the various tools of a machine shop that could be used without a permanent foundation were transported mounted on motor trucks or trailers together with suitable cranes to dismount and handle cannon and carriages. Inasmuch as modern artillery is now so completely motorized the mechanical problems of truck and tractor engines and chassis are added to those of the guns and carriages, while the tank and various other tracklaying vehicles also require extensive repairs and replacements.

The first and simplest unit on the repair program is the light repair truck having a special steel box body on a  $\frac{1}{2}$ -ton chassis. There is a single seat in front and chests containing carpenter's and machinist's hand tools are carried, along with automobile tools and supplies, lubricants and greases, so that the equipment with a



The artillery repair truck showing part of machine-shop equipment carried



Milling-machine trailer, with sides and tail put down for work

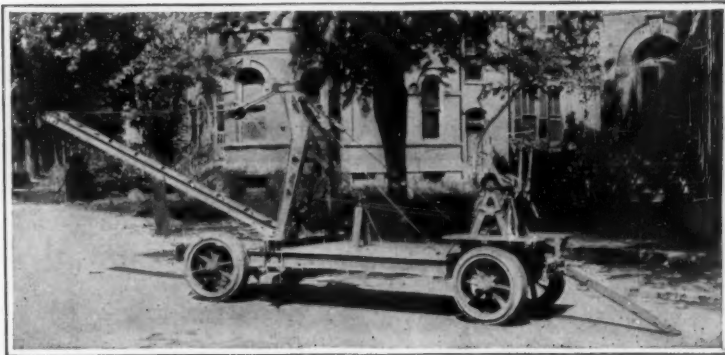
skilled mechanic is available for light emergency repairs and general utility work beyond the facilities of the ordinary equipment and personnel of a battery or other organization. These light repair trucks were furnished to heavy motorized artillery regiments, motorized machine gun battalions, mobile ordnance repair shops, ammunition trains, army and corps artillery parks, and the trench mortar battalion attached to a corps.

The next item is the so-called ammunition truck, a motor vehicle with a four-wheel-drive type of chassis and a special steel body, which, while designed to accommodate the original packing boxes of ammunition, can carry any supplies or equipment needed, including drums of gasoline or water. The ammunition truck is used as a road tractor for hauling artillery or trailers of various types described later.

The artillery supply truck, also motor driven, consists of a specially designed body mounted on a four-wheel-drive chassis of either two or three tons capacity, and naturally plays an important part in the repair shop scheme. It carries spare parts for artillery and motor vehicles, extra wheels, tools and supplies, cleaning and preserving materials, and chests for tools and other articles such as the spring chest, supply chest, forge chest, fluid chest, etc. There are five different arrangements of loads depending upon the nature of the organization to which the supply truck is issued. In some of the trucks there is space for parts of optical and electrical instruments, and raw material and bar stock are carried.

The equipment repair truck, able to perform actual repairs on machine guns, small arms, saddlery, and personal equipment, is attached to division and corps shops and to each heavy artillery mobile repair shop. Here on a four-wheel-drive motor-truck chassis a special body is placed whose sides let down to form working platforms, as shown in our illustration. This body contains a series of steel chests, cabinets and drawers, and work benches, on which are mounted sewing machines for canvas and leather, four vises, and a hand-operated emery wheel grinder. There are also complete sets of carpenter's and saddler's tools.

The most interesting and self-contained unit of the repair shop is the artillery repair truck, which like other elements is mounted on a four-wheel-drive motor-truck chassis and is a very complete small machine shop, as will appear from a summary of its equipment. This includes a 9-inch motor-driven lathe, bench type, with milling and gear-cutting attachment; a 14-inch motor-driven drill press; a 12-inch motor-driven emery-wheel grinder; portable electric drill; oxyacetylene cutting and welding apparatus; electric motor-driven air compressor with air reserve tank; pneumatic riveting hammer; blacksmith outfit, including standard ordnance forge; and a complete assortment of tools necessary to repair artillery matériel and motor vehicles. To supply current for lights and for operating the machine tools there is a four-kilowatt generator which is direct-connected to a four-cylinder



The four-ton crane unit that permits the dismantling of cannon and the handling of the heavier parts

gasoline engine mounted on the floor of the truck. The sides of the steel body drop to form additional working space, while, as in the case of the equipment repair truck, there is a canvas cover and sides.

Each artillery repair truck is accompanied by an artillery supply truck with bar stock and other raw materials used in making repairs. The artillery repair truck is supplied to motorized artillery organizations,

of 35 vehicles for men and equipment. In each section is a machine gun car for the personnel, 16 trucks of various types carrying machinery and supplies, 12 trailers drawn by the trucks and having various loads, a four-ton crane, a kitchen trailer, and four motorcycles.

One of these shops was designed for each brigade of six-inch guns and heavy howitzers of army artillery, this latter, it may be said in passing, being independent of the corps artillery.

As indicating the extensive scale on which these shops were planned, it was stated that by July 1st, 1918, material had been ordered for 24 heavy artillery mobile repair shops. Their completeness may be realized from the following outline of some of the more important units. One three-ton truck, which like the others is fitted with the standard artillery repair body, contains a complete gasoline-engine-driven two-cylinder air-compressor unit and complete equipment of pneumatic tools, such as riveters, hammers, drills, and grinders. A second truck is used as a tool room, containing such small tools as drills, precision instruments, reamers, tool holders and different attachments, a key-bitting machine, two-wheel high-speed grinder, and a combination tool and cutter grinder. Another three-ton motor truck carries a 24-inch circular saw to rip wooden beams eight inches square and also a heavy automobile arbor-press large enough to press hubs into wheels or similar work. Six motor trucks carry spare parts or complete assemblies, such as motors, transmissions, etc. Two three-ton trucks carry the personal baggage of the organization, while one truck of similar size is fitted up as an office.

The group also includes a standard equipment repair truck with full complement of tools and equipment, an ammunition supply truck for carrying oil and gasoline in drums, an artillery supply truck with bar stock and raw material, and a one-ton delivery truck.

These trucks are accompanied by 13 special four-ton trailers to which are supplied a rectangular body with hinged sides, fronts and tailboards, and an adjustable top and canvas cover. These trailers carry the machine tool equipment of the shop, which includes a 2-A unit

(Continued on page 97)



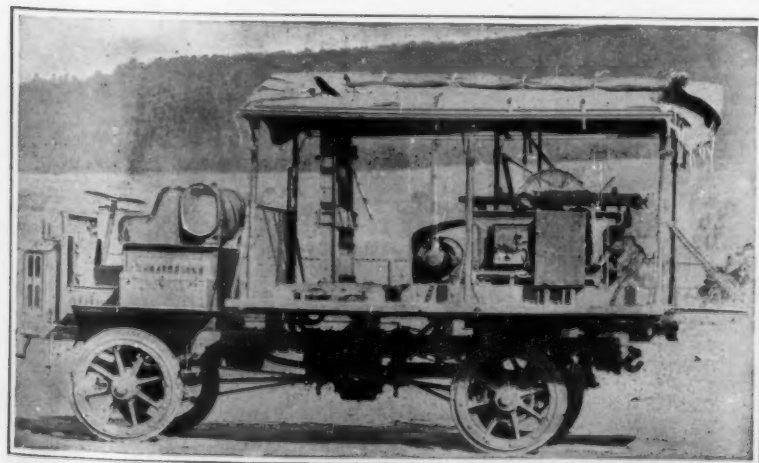
Equipment repair truck for machine guns, small arms, saddlery and personal equipment

one repair truck and one supply truck to each battalion; to ammunition trains, corps and army artillery parks, railway mounted artillery regiments, mobile ordnance repair shops, and the trench mortar battalion in the corps, according to the tables of organization.

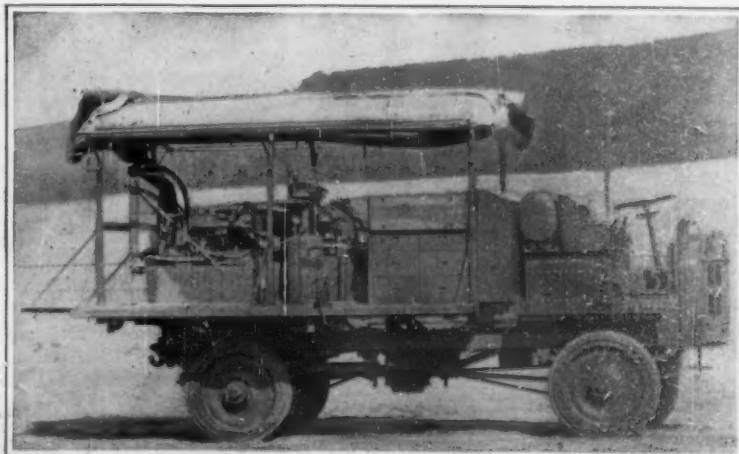
From the various units described the mobile ordnance repair shop is organized and one of these is attached to each division. Normally it consists of six artillery supply, three artillery repair, three equipment repair,

tion supply truck for carrying oil and gasoline in drums, an artillery supply truck with bar stock and raw material, and a one-ton delivery truck.

These trucks are accompanied by 13 special four-ton trailers to which are supplied a rectangular body with hinged sides, fronts and tailboards, and an adjustable top and canvas cover. These trailers carry the machine tool equipment of the shop, which includes a 2-A unit



This truck carries a 24-inch circular saw and an arbor press large enough for pressing hubs into wheels



Three-ton truck carrying gasoline air compressor and complete line of pneumatic tools for all kinds of work

# Mechanical Equipment of the Farm

*Latest developments in agricultural machinery and practical suggestions for the farmer*

Conducted by HARRY C. RAMSOWER, Professor of Agricultural Engineering, Ohio State University

## A Novel Test of a Farm Tractor

ON May 29th, the farm tractor shown on this page started from Elmhurst, Long Island, on the first lap of a journey to the Pacific Coast. Equipped with solid rubber-tired road wheels this tractor is drawing a five-ton truck and travels at the rate of from 10 to 15 miles per hour. The regular traction wheels may be seen on the rear of the truck.

This outfit passed through Columbus, Ohio, June 17th, "fit as a fiddle" and seemingly little the worse for this portion of the journey. No doubt a great deal of attention will be attracted along the road and the trip will be a good test of the durability and all-round effectiveness of this tractor.



The farm tractor that is making a test run from coast to coast

tractor owners to lose valuable time in making adjustments and repairs, and they cause unnecessary upkeep.

The super-drive tractor, illustrated on this page, was designed and built to overcome the hardships worked by these evils. The effort to do this has produced a tractor of 5,000 pounds weight which will consistently pull four 14-inch plows six to eight inches deep even under adverse

these delays do not occur, a great deal of power is lost on account of the excessive friction. The unit construction tends to do away with these troubles because there is no frame to work loose in any part. There is no frame running from front to rear—the unit construction consists of rear live axle and enclosed transmission, coupled direct to the engine cradle and front axle support. It is frame and mechanism all in one—self-contained, simple and powerful. Heavy-duty roller bearings are used at every friction point—even on the front axles.

Another cause of lost power and friction is open gears. Dirt, dust and grit work their way in, causing troubles which make the operator stop to clean out the parts and which cause a grinding that uses up valuable power. All gears in the tractor shown run constantly in oil and are encased in housings which obviate the trouble caused by dust, dirt and grit.

Excessive weight and friction are not only wasters of power but they limit the amount of work that a tractor can do. Twenty per cent more power may not at first seem as important as it really is. What it really means in working power is an extra plow—four plows instead of three—one-third more work accomplished with the same effort and at the same cost. For instead of using the power to carry excess weight and excess friction, it is used usefully in actual work.

The human body is a wonderful piece of mechanism—the human body is equipped to absorb shocks, which as everyone knows are destructive when not taken up. A system for absorbing shocks has been incorporated in the

(Continued on page 97)

## The Four-Wheeled Corn Planter

THE wheel of the checkrow corn planter has passed through quite an evolution in recent years. Not long since, planter wheels had solid, flat rims, which were later made concave, the better to pack the soil over the seed. However, it was found that in clay soils the earth would bake where it had been packed, if a heavy rain occurred soon after planting, thus frequently interfering with the growth of the young plants.

The middle portion of this solid rim was then cut away with the edges still more concave. The idea, which worked in practice, was that the soil would be packed on either side but not directly above the seed. The further idea was then conceived of dividing each wheel into two parts and setting the parts at an angle to the vertical. The planter shown on this page is of this type. It seems reasonable that these wheels having more gather than the vertical wheel should cover the seed and pack the soil better than the vertical wheel, while, at the same time, loose soil is left directly over the seed.

The planter shown is also equipped with two markers which facilitate turning at ends.

## A Tractor Designed for Power Economy

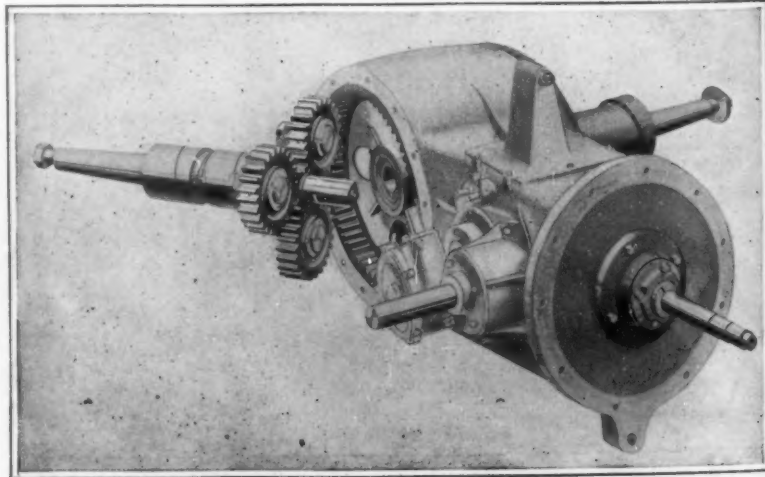
EXCESSIVE weight and excessive friction are thieves of fuel—excessive jars and jolts are thieves of time. All of these factors are thieves of money, for they cause



A corn planter with double wheels to give better ground surface

conditions. The driving principle it is claimed delivers 20 per cent more engine-power to the drawbar than any other driving principle in tractor use.

In this tractor excessive weight has been eliminated because the tractor is of unit construction. But this construction does even more than eliminate unnecessary weight—it keeps the mechanism and bearings of the



The super-drive tractor that is designed to save power, and a detail of its transmission

### The Sunken Battle-cruiser "Seydlitz"

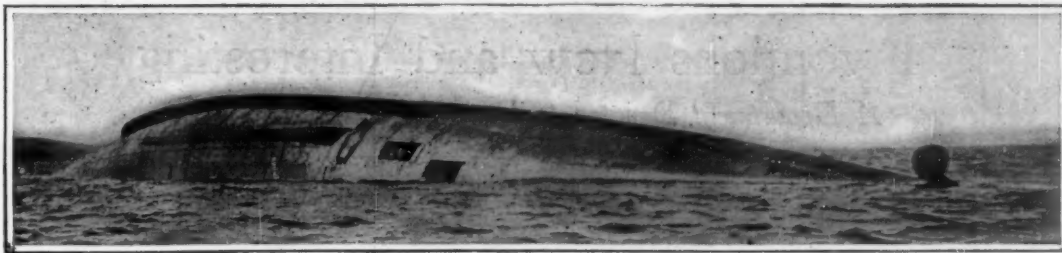
IF the future visitor to Scapa Flow did not know what had happened to the interned German fleet in that remote harbor, he might be excused for supposing that the monstrous thing which projects above the water, as shown in our illustration, was a submarine of vast proportions. As a matter of fact it is the bottom, or rather one-third of the bottom, of the famous German battle-cruiser "Seydlitz," which took part in the running fight of Dogger Bank and, later, in the great Battle of Jutland.

Some of the wrecked ships sank on a fairly even keel, as did the "Hindenburg"; others, like the "Seydlitz," turned over and settled on their sides. This view shows that the ship turned turtle to starboard, leaving the port side and about one-third of the bottom exposed. The dark object astern is a blade of the port wing propeller, the "Seydlitz" being driven by turbines, acting on four shafts, whose horse-power ranged from 90,000 to a maximum of about 100,000.

The "Seydlitz" was built at Hamburg, in 1913. She was 656 feet long; 93 1/4 feet broad; her displacement was 25,000 tons; and her speed was about 27.5 knots. She was heavily punished and set on fire in the Dogger Bank fight, and was severely handled by gunfire at Jutland.

Many people were surprised that such big ships could have been sunk so quickly; but if we consider the great number and large size of the openings from the interior of the ship to the sea below sea-level, the problem becomes simple.

Referring to the photograph, the long dark object at the turn of the bilge is the bilge keel, put there to prevent rolling. Below it is one of the docking keels, and the two oblong openings astern of the latter are the two intakes for the two port turbine condensers. There are two more of these on the opposite side of the center of the ship. The inflow of water is controlled by large valves.



Copyright, Underwood &amp; Underwood

German battle-cruiser "Seydlitz," as she lies at Scapa Flow

Now, since these openings are fully 30 feet below the surface, there must be a pressure of nearly a ton per square foot upon the valves. In preparing to sink the ships, all that would be necessary would be to take out a section of pipe between the inlet valves and the condensers. On opening the Kingston valves, as they are called, the water would rush into the engine rooms of the "Seydlitz" under a pressure, as noted above, of nearly a ton per square foot.

But there are many other pipes, inlet or outlet, opening through the bottom or side of the ship; and if all of these were opened in such a way as to permit a free inflow and if the watertight doors and other connections through the bulkheads, such as piping, etc., were left open, it would not take long to put the largest ship down.

The "Tennessee" of 28,000 horse-power requires two 28-inch main injection valves to control the intake of water for her condensers. The "Seydlitz," with 90,000 to 100,000 horse-power would require over three times that capacity, and the opening of these valves alone would suffice to sink the ship in a brief space of time, if the water-tight doors leading to the engine rooms were open.

If it is doubtful if any extensive salvage operations will be carried out. Because of the differences in guns, shells, motive power, and miscellaneous gear and machinery, the ships would not match with those of any navy, and it is probable that the great cost of salvage operations in that remote and inhospitable spot would outweigh the value of the recovered vessels—if indeed they can be salvaged at all.

### A Naval Land Gun That Can Fire from the Track at a Moment's Notice

By C. L. McCrea

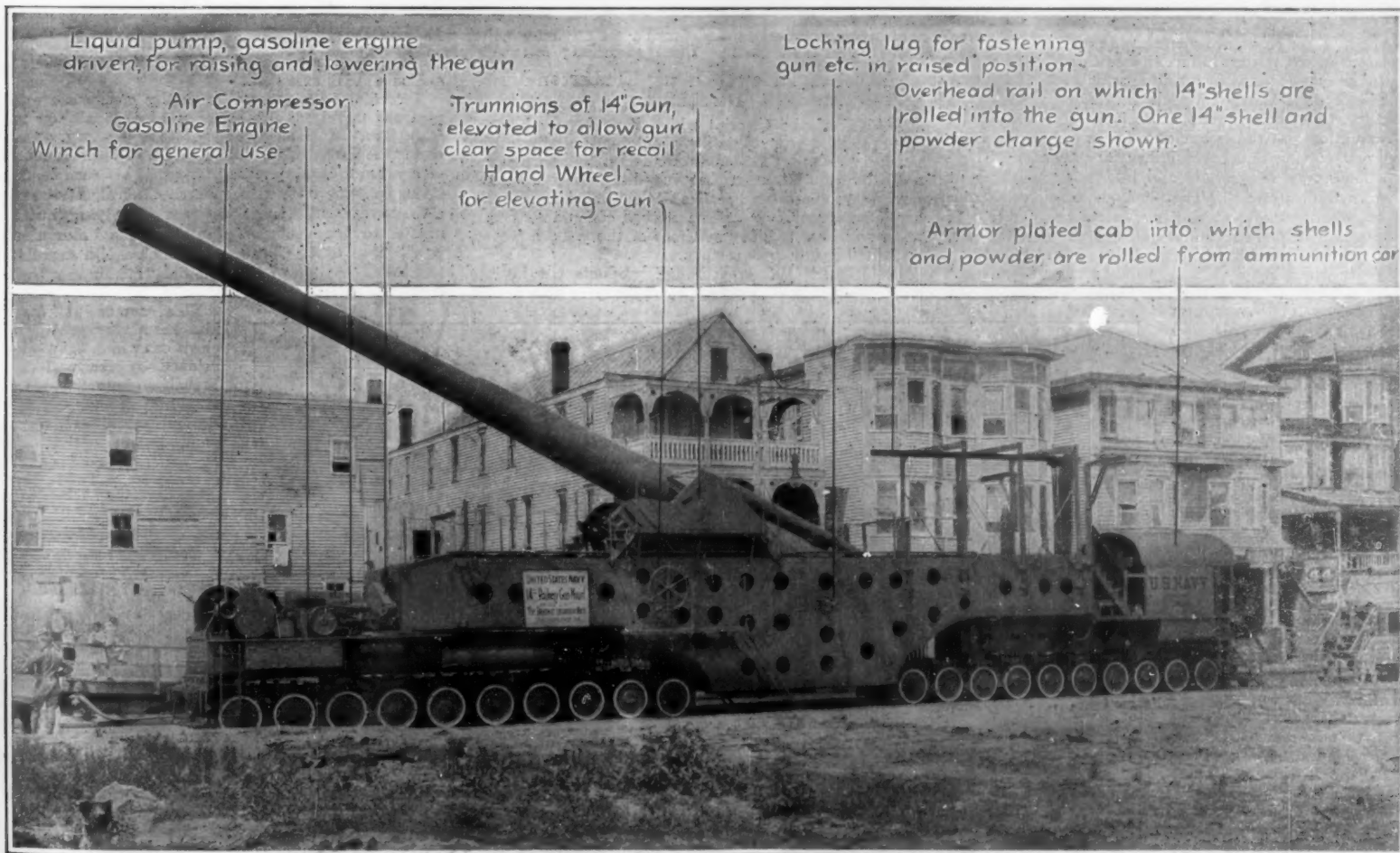
IT will be remembered that when the heavy German long-range guns were bombarding the Allies on the western front last year, the Navy Bureau of Ordnance took some of the 14-inch 50-

caliber guns from our battleships and placed them on railway mounts, sending them abroad and getting them into action several months before the signing of the armistice. These guns were described in the SCIENTIFIC AMERICAN of February 8th, 1919. They were the only American made and operated heavy guns that fired against the Germans.

The original Navy gun car for mounting the monster 14-inch Navy gun, which weighs in the neighborhood of 95 tons, was a car 88 feet long, mounted on 24 wheels, and weighing, complete with the gun, about 275 tons. It was designed to allow the gun to fire directly from the rails at angles of elevation up to 15 degrees. When firing at higher angles of elevation, a pit was dug and a foundation of structural steel and timbers provided on which the gun car rested, so that while firing the gun became a fixed land mount.

The foundation was prepared in advance of the arrival of the gun car, a day's time being required for all preparations. The gun itself could, however, be moved from its foundation and made ready for transportation in a few minutes. On many occasions when the Huns were retreating, however, a big gun capable of firing 20 to 30 miles directly from the rails on a few moments' notice, without any preliminary preparation of the tracks, etc., would have been invaluable in destroying German troop trains, supply stations, etc. Neither the Americans nor the Allies had such a gun. Even the newest models and designs of French and American-French railway guns required special preparation of the railroad track before they could be fired—it was necessary to

(Continued on page 98)



Liquid pump, gasoline engine driven, for raising and lowering the gun

Air Compressor  
Gasoline Engine  
Winch for general useTrunnions of 14" Gun,  
elevated to allow gun  
clear space for recoil  
Hand Wheel  
for elevating GunLocking lug for fastening  
gun etc. in raised positionOverhead rail on which 14" shells are  
rolled into the gun. One 14" shell and  
powder charge shown.Armor plated cab into which shells  
and powder are rolled from ammunition car

The gun, 58 ft. 4 ins. long, weighs 95 tons. The gun, slide, elevating gear etc., weigh 160 tons. The girders supporting gun are 10 ft. deep by 94 ft. long and weigh 80 tons. The car and gun complete weigh 320 tons. Length of car, 130 ft. Maximum range of gun, 30 miles.

Naval 14-inch railroad gun that can fire from the rails at a moment's notice

## Inventions New and Interesting

*A Department Devoted to Pioneer Work in the Arts*

### Collapsible Periscope for the Press Photographer

**E**VEN a press photographer is not always so fortunate as to be in the front line of the crowd when something is happening. Working on that assumption, an inventor has recently introduced a convenient form of collapsible periscope intended for use with the reflecting type of camera. As will be noted in the accompanying illustration, his device is readily carried about in folded form, while when set up and ready for use it is attached to the front of the usual reflecting type of camera. In this manner it becomes possible for the press photographer and his camera to "see" over the heads of the crowd, and "cover" the event whatever it may be.

### Acetylene Saves the Day

**T**O appreciate fully the importance of an ample gas supply in the printing of a daily newspaper, one should see the large quantity consumed in any modern type-setting room for melting the type metal.

The *Press*, of Memphis, Tenn., ordinarily depends upon the city gas supply for this purpose, hence there was great consternation one day in the offices of this publication when the city gas supply failed for a period of several hours. Newspaper men will tell you that an hour is an eternity in their business. Time is reckoned in minutes and even in seconds.

The emergency called for the immediate installation of a substitute gas supply. It was quickly decided to use acetylene for the purpose. This was a wise decision, for acetylene is easily obtained in convenient dissolved form in metal cylinders in almost any locality, and produces a very hot flame suitable for quickly heating the metal melting pots in the type-setting machines. Compared with other gases commonly used for heating purposes, acetylene has a much greater heating power; in fact, it has three or four times as many heat units per cubic foot.

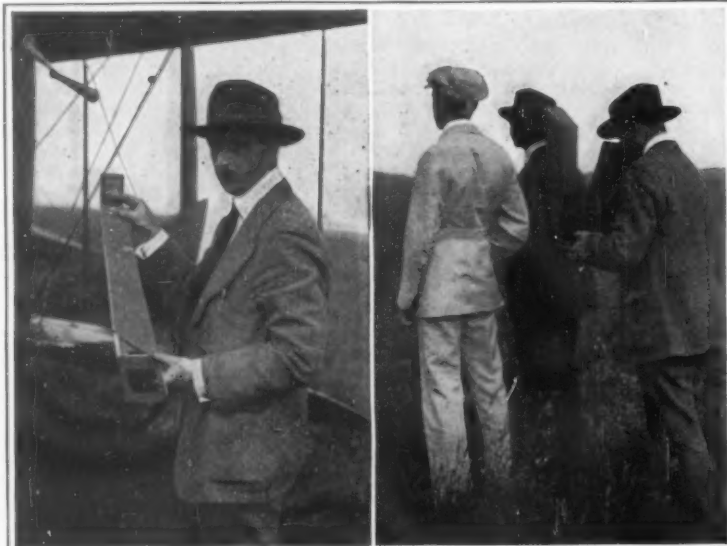
The cylinders are supplied in different sizes, the smaller ones being used extensively for automobile illumination and the larger ones for oxyacetylene welding and cutting and other industrial purposes. There are some very remarkable and interesting facts about these cylinders of gas. They embody a scientific principle which permits storing an enormous quantity of acetylene in a phenomenally small space. For instance, as much as 300 cubic feet of acetylene is contained in a cylinder which has a volume of only two or three cubic feet. The explanation is found in the fact that liquid acetone (one of the products of the distillation of wood)

has the ability to absorb acetylene much the same as water dissolves sugar. At ordinary atmospheric pressure and temperature acetone will dissolve about twenty-four times its own volume of the acetylene and for each additional atmosphere of pressure to which it is subjected a similar quantity will be dissolved. As dissolved acetylene is supplied under a pressure of about 17 atmospheres (250 pounds per square inch), the feasibility of storing so much gas in such a small space will be apparent. The cylinders are completely filled with a porous material, such as asbestos; this is saturated with acetone, after which the acetylene is dissolved under pressure.

As the pressure in the cylinder becomes reduced, due to the withdrawal of the gas, the acetone's absorbing power likewise diminishes, insuring a steady liberation

of gas. This gas flow is easily regulated by means of a reducing valve which also delivers the gas at a low pressure suitable for the purpose for which it is being used.

The Memphis *Press* called upon a garage and a welding shop in the neighborhood for acetylene to tide it over its difficulties. The former sent two small cylinders and the latter supplied a large one full of the gas. These were put to work immediately and the paper soon appeared, making acknowledgement in heavy headlines for the timely aid received from the emergency installation.



Copyright, Press Illustrating Service

This collapsible periscope is intended for the press photographer who may not always be in the front line when something is taking place

### Effect of Time of Cutting Timber on Its Durability

**M**ANY of the theories which have been advanced regarding the durability of wood attribute too much importance to the time of cutting. As a matter of fact, the time of cutting has very little effect upon the durability or other properties if the timber is properly cared for after it is cut. The method of handling posts, poles and logs at different times of the year, however, does influence their durability.

Posts, poles and other rough products cut in late spring and early summer are more likely to be attacked

by insects and fungi because the wood is freshly cut and in the most favorable condition for attack at a time when insects and the spores of fungi are most active. Seasoning also proceeds more rapidly during the warmer months and may cause excessive checking. If the wood is peeled when cut and piled openly on skids for seasoning the opportunity for decay will be reduced to a minimum, but checking will not be retarded. In no case should the wood be allowed to lie in direct contact with the ground. If checking is an important consideration it can be reduced somewhat by locating the piles in a shaded but dry place. The bark peels most easily in spring. It can be removed at any other time of the year but the labor and expense will probably be greater.

Timber cut in late fall and winter seasons more slowly and with less checking than during the warmer months and when proper storage or handling is impracticable, winter cutting is best. Fungi and insects do not attack wood out of doors in cold weather and by the time warm weather arrives the wood is partly seasoned and somewhat less susceptible to attack. It is for this reason that winter cutting is advantageous and not on account of a smaller amount of moisture or sap in the wood in winter as the popular belief has it. There is practically no difference in moisture content of green wood in winter and summer

### The Soil Considered as a Living Organism

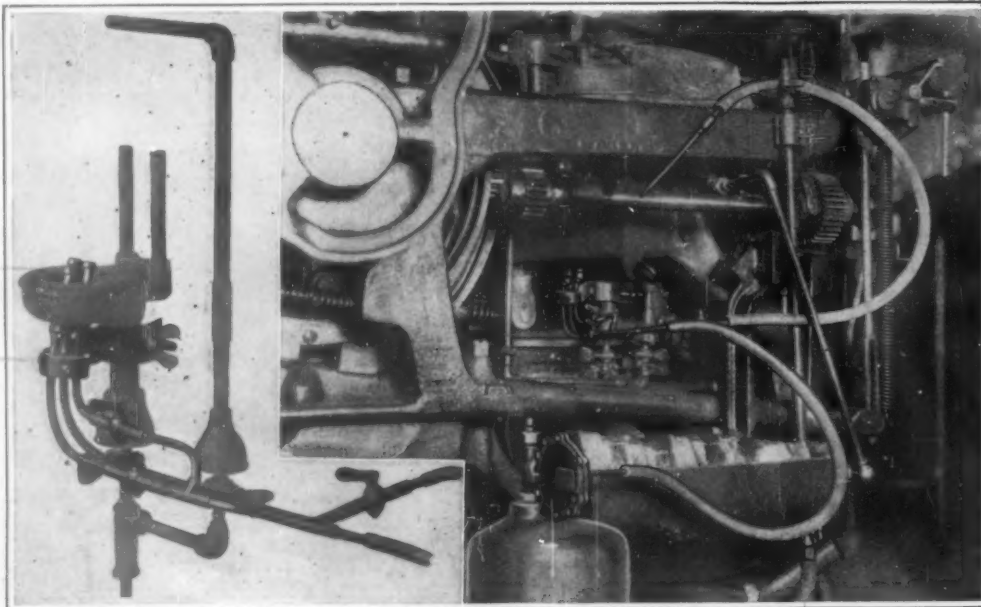
**A** GREAT advance was made in the science of agriculture when the mineral elements of the soil were subjected to qualitative and quantitative analysis so that a definite knowledge might be obtained of the plant food present in any given specimen and any lack be remedied by the application of suitable fertilizers. A more recent view, however, regards the

soil as a living organism.

According to this view the earthy elements are to be regarded merely as the skeleton of the said organism while its living tissue consists of its respiratory, digestive and muscular portion. Respiration in the soil consists, of course, of the interchange of gases between its interstices and the outer atmosphere. The digestive apparatus consists of the interspaces supplying nutritive liquids to the roots of plants and the "muscular action" refers to the contractions which excite coagulation and which are due to the colloidal "membranes" which cover the particles of earth.

This somewhat fanciful idea has a very practical application which has been developed by the well-known French Agronomist, M. G. Dumont, of the National Agricultural School, at Grignon. When this authority desires to study a given piece of earth, he so treats it that not merely its mineral elements but its texture, i. e., the fineness of the particles and the size and arrangements of the "cells" or interspaces can be studied.

For this purpose the desired specimen is first drenched with water glass while *in situ*, and a model is then taken of its interior arrangement by means of paraffin. The larger spaces or cells are those which contain air while other spaces including what may be regarded as capillary tubes constitute small reservoirs of water "which form an obstacle to the desiccation of colloidal coatings and thus insure the persistence of their properties or of their specific functions."



An emergency connection for operating a linotype machine with acetylene in place of ordinary gas, and a view of the acetylene feed pipe as inserted through a clamp attached to the regular burner



Lucky Strike really is toasted.

Toasting the Burley tobacco gives it a delicious flavor you cannot get in any other cigarette.

This toasted flavor is your reason for smoking Lucky Strike. Don't you like a good, straight reason like this for buying a good cigarette?

We give a fact about every one of our brands: Lucky Strike—it's toasted.

Guaranteed by  
*The American Tobacco Co.*  
INCORPORATED

**It's  
 toasted**

## Recently Patented Inventions

Brief Descriptions of Recently Patented Mechanical and Electrical Devices, Tools, Farm Implements, Etc.

### Pertaining to Apparel

**SHIRT.**—H. S. KATZ, Maple Knole Farm, Danboro, Pa. An object of the invention is to provide a shirt which is so constructed that it will bunch about the hips and thighs. A further object is to provide a shirt so constructed that the sides are free to hang in extended position in the trousers, and to provide tail portions which are not inclined to work upwardly.

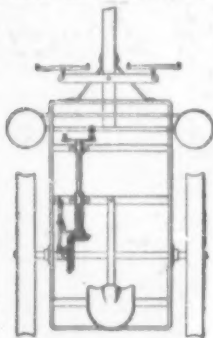
### Electrical Devices

**SPARKING PLUG FOR EXPLOSION-MOTORS IN GENERAL.**—J. F. LEDONIS, Billancourt, France. This invention relates to sparking plugs in which the central electrode is cooled by a large cooling surface constituted by using the least possible quantity of material. The object is to obtain this cooling for the parts capable of storing a large excess of heat, such as the central electrode and its insulation. This system of plug offers a very high cooling power the advantage being its light weight, but slightly sensible to the action of centrifugal force.

### Of Interest to Farmers

**THRESHING APPARATUS.**—A. E. REITZEL, 1311 L St., N. W., Washington, D. C. The invention relates generally to threshing apparatus and more particularly to an apparatus for threshing peas and beans, the object being to provide a construction whereby to operate speedily and effectively without danger of cracking or damaging the peas and beans themselves, as if they become cracked or damaged they will not germinate, and their commercial value is considerably curtailed.

**CHECK-ROW DEVICE FOR CORN-PLANTERS.**—O. H. KOHLHAAS, Calumet, Mich. This invention has for its general object to provide a device which may be in the nature of an attachment for a corn planter already in use, or which may be an essential part of a machine as



PLAN VIEW OF PLANTER WITH CHECK-ROW APPLIED

originally built, for the purpose of automatically dropping seeds the proper distances apart in the rows without the use of check wires; the device comprises a shaft which is adapted to be thrown into and out of gear with the axle, imparting a periodic rocking motion, to cause the hopper to open and drop seeds at uniform distances.

**HOG OILER.**—H. D. DUCKHAM, Kenton, Ohio. The object of the invention is to provide a device wherein a container is provided for the oil, together with a depending rubbing bar mounted to swing with respect to the receptacle, and wherein means is provided in the receptacle controlled by the forward movement of the bar for delivering a predetermined amount of oil, the bar having at its lower end a curved portion for engaging beneath the neck, flank, and for legs of the hog to thoroughly oil the same.

**TRACTOR.**—C. GREGORY, Box 11, R 5, Petaluma, Cal. The invention relates to tractors of the type provided with a caterpillar drive, the object is to provide a simple inexpensive and small tractor. The tractor comprises a frame having two longitudinal sections, a caterpillar mechanism in the rear of one section, a supporting wheel in the other section, a motor in the same section of the frame as the caterpillar, a shaft in the section with the supporting wheel and coupled with the motor, a transmission mechanism, controlling levers, gearing between the transmission mechanism and one of the shafts of the caterpillar, and a steering wheel in front of the frame.

**SHOCK LOADER.**—J. J. KROON, Bottineau, N. D. The invention relates to a self-propelled shock loading and carrying machine for the purpose of picking up the sheaves of a shock and loading them into the basket or body of the machine, so that when the body is filled, the machine is driven to the threshing machine and there unloaded, where the sheaves are pitched by men to the feeder of the threshing machine.

**DISK SCRAPER.**—A. A. RODGERS, Estlin, Saskatchewan, Canada. This invention relates to scrapers comprising a blade and shank adapted to be bolted to the upper end of a supporting standard secured to the axle of the disk. The prime object is to provide a counterbalanced scraper-blade shank so that the weight of the arm will tend to hold the blade to its work against the disk.

### Of General Interest

**MANUFACTURE OF IRON AND STEEL.**—G. A. JARVIS, St. Georges, Wellington, England. The object of this invention is to provide means for the utilization of scrap or waste material, such as steel turnings, in the manufacture of iron and steel. The process comprises means for preparing iron and steel turnings for re-melting, which consists in crushing the said material to powder and incorporating with such powder a mixture of tar and lime, and subsequently subjecting it to a baking heat.

**BELT.**—G. E. CABR, 27 Dundee St., Boston, Mass. The invention relates to connecting means for belts connecting the parts together so that a smooth continuous surface will be presented. The object is to provide a belt with a stepped arrangement at the ends or at any point whereby the parts may overlap, the stepped formation being associated with a rubber connecting layer which will connect the parts together without presenting a raised portion on the inner surface of the belt.

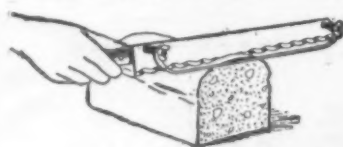
**SAFETY PUSH PIN.**—J. P. BURKE, Box 161 Struthers, Ohio. This invention relates to fasteners in the nature of pins or tacks commonly used for attaching small pictures, calendars, etc., to fixed objects such as walls or the like. An object is to provide a push pin so constructed as to provide automatically a guard to prevent the point of the pin under normal conditions from pricking the operator's fingers or scratching or abrading the operator's clothing or any other device.

**DRILL PRESS.**—W. F. MCCARTY, Defiance, Ohio. The object of the invention is to provide a drill press more especially designed for heavy service. Another object is to provide an automatic variable feed mechanism for the drill spindle. Other objects are to allow the operator to feed the drill spindle by hand, to insure automatic lubrication of the press and to supply the lubricant to the work and to the drill to insure proper drilling, and to permit of readily detaching the variable speed gearing for the drill spindle from the main frame of the press for convenient inspection, repairs or other purposes.

**BASKET REINFORCEMENT.**—J. J. DEMUTH, Route 1, McIntire, Iowa. The invention relates to reinforcing means for willow or fiber baskets and has for its objects to provide a simple and strong combination easily adjusted to any size of basket. The device comprises an adjustable bottom reinforcing frame adapted to fit snugly within the bottom rim of a basket, the frame being held in position by braces extending upwardly alongside of the basket walls and secured to the top rim of the basket.

**CUFF.**—G. W. COOPER, 163 Richmond St., Brooklyn, N. Y. Among the principal objects of the invention are to avoid abrasive wear of cuffs, to prolong the service life of articles of clothing in the construction of which the fabric is sharply folded, to strengthen the structure without increasing the cost, to reinforce structures while preserving neatness of appearance, and to reinforce articles without increasing the quantity of cloth required.

**ADJUSTABLE SLICING KNIFE.**—C. H. KRAPF, 1068 E. 15th St., Flatbush, N. Y. The invention is particularly designed for cutting slices of bread, cake, meat and the like of any desired thickness. The device comprises a handled knife blade provided with apertures adjacent

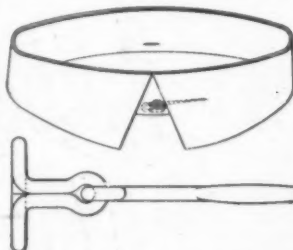


A PERSPECTIVE VIEW OF THE DEVICE IN POSITION FOR CUTTING

the back near the ends of the blade, bolts engaging the apertures, projecting from the front face of the knife blade, wing nuts screwing on the outer ends of the bolts, an adjustable gage rod disposed parallel to one side of the cutting edge, and springs coiled on the bolts.

**EXTENSION STAFF AND CONTAINER FOR FLAGS.**—A. COE, 1021 Summit Ave., Jersey City, N. J. A specific object of the invention is the provision of a flag staff, one portion of which is in the form of a container in which the flag-carrying section is moved so as to extend or collapse the staff, the construction being such that the flag can be wound within the container without the hands coming into contact with the cloth of the flag, thereby dampening the flag and making a permanent curl therein will be prevented.

**COLLAR BUTTON.**—R. V. SAMPSON, 1643 Champa St., Denver, Col. The invention has for an object the provision of a construction which acts in the double capacity of a button hook and a collar button whereby the button part may be



PERSPECTIVE VIEW OF A COLLAR WITH BUTTON, AND PLAN VIEW OF THE BUTTON

easily placed in position. Another object is to provide a collar button with a pendant which acts as a retaining member as well as a means for causing the button to be quickly and easily placed in position.

**SHIP CONVOY SUBMARINE DEFENSE.**—M. CARRAU, Piedras, 607 Montevideo, Uruguay. This invention relates more particularly to a convoy by which one or more vessels are enclosed by submerged bomb-carrying cables looped from and towed by boats forming part of the convoy, and maintained at such distance from the vessels being convoyed that a submarine cannot come within torpedo range without encountering the cables and setting off a contact bomb or mine whereby the attacking submarine will be destroyed.

**WINDOW CLEANER.**—L. SONDEREGGER, 1887 Vyse Ave., Bronx, N. Y. The object of the invention is to provide a window cleaner especially designed to permit the user to clean the outer faces of the window panes of upper and lower sashes. Another object is to permit of readily placing the cleaner in position on the window and manipulating it without requiring undue physical exertion on the part of the operator. Another object is to provide a cleaner which is exceedingly light to permit of conveniently handling it.

**ADVERTISING DEVICE.**—C. GARCILLAN, 410 W. 23d St., New York, N. Y. The invention relates to advertising devices of the illuminated type, and more particularly to a device in which there is an illuminated movable object, as distinct from objects in which the movement is obtained by a light effect on the object. Another object is to provide an advertising device which moves on a mono-rail track on which the moving object is balanced by weights depending below the track.

**CASE FOR HOLDING AND SHIPPING BOTTLES.**—L. LEWIS, McAlpin, W. Va. This invention comprises a wooden box or receptacle having horizontal flanged partitions forming bottle supports, the same being constructed of sheet metal and provided with openings to receive the bottles, and with flanges for supporting the partitions and bottles in the required position in the box. The openings in the upper and lower portions coincide vertically so that a bottle fills and is held supported in vertical position in the openings.

**INKWELL AND COVER THEREFOR.**—C. E. BIRCH, Lawrence, Kan. This invention is more particularly intended for use on school desks. The inkwell may be given large capacity as compared with ordinary inkwells of schools; a cover is provided for detachably securing the well to the desk, but adapted to be readily detached for cleaning the inkwell, the cover prevents accidental displacement, protects the ink from being spilled, and minimizes the evaporation of the ink, permitting only a limited opening to expose the ink.

**AUXILIARY RIBBON-HOLDER.**—W. A. DE LONG, JR., 1 Madison Ave., New York, N. Y. Among the principal objects which the invention has in view are to provide means for readily

changing the printing ribbon on typewriters, to multiply the devices for color printing arranged to be readily and quickly substituted for one another, to economize the color inserts of ribbon and to provide an attachment so arranged that the ribbon may be readily moved to expose the written or printed character.

**JEWEL.**—H. GILSEY, 22 Wiggins Block, Cincinnati, Ohio. Among the principal objects which the invention has in view are to arrange a number of relatively small jewels to produce the impression of a single unit jewel, to simulate a jewel without separate or distinct mountings for the jewel, to provide a jewel which may be attached to a ring with full exposure of the sides of the jewel, and to provide a jewel adapted to be used in a plurality of services.

**AUTOMATIC DOOR.**—J. J. SABIN, 114 E. A St., Yakima, Wash. The invention has for its object to provide a door especially efficient for use in mines, but adapted equally well for use as garage doors, and in any case where the door is to be automatically opened by the weight of the moving vehicle. The invention is designed to dispense with the services of the trapper, the arrangement being such that the weight of the car as it moves toward the door will open the same, the door being closed by counterweight.

**SHARPENER FOR DISK HARROWS.**—LE ROY HAINES, Colchester, Ill. The invention relates particularly to a tool to automatically sharpen harrow disks while the harrow is in operation. An object of the invention is to provide a device adapted to be secured at one end of the scraper bar shaft to hold a file, a cutting steel, or the like in position to be yielding pressed against the edge of a disk of the harrow so that the latter will be sharpened in the turning thereof while in operation.

**TOWEL CABINET.**—W. W. BAGLEY, Room 312, 50 E. 42d St., New York, N. Y. The invention relates to towel cabinets for individual towel service; it refers more particularly to a cabinet which will afford storage room for a number of packages of clean towels so secured to the cabinet that they cannot be removed therefrom except for placing the packages into serviceable position. A further object is to provide a towel carrier which will discharge only one towel at a time.

**CONE HOLDER.**—J. DE RAKE, 4005 Kathleen Ave., Baltimore, Md. The invention has for its object to provide a device in the form of a plate with a series of circular openings spaced inwardly from the periphery for receiving the ice cream cones, and cords for supporting the plate, and means for detachably holding a napkin in position over the cone to protect the same during transportation.

**BOAT CONSTRUCTION.**—E. K. FAHLOF, Springfield, Mo. An object of the invention is to provide a construction wherein is obtained a combination of speed, stability and capacity with lessened draft and widened beam. A further object is to provide a construction having greater rigidity, and wherein twin or triple screws may be provided, and centerboards used and without outboard mountings for the propeller shaft, and wherein hydroplanes may be used without affecting the side lines.

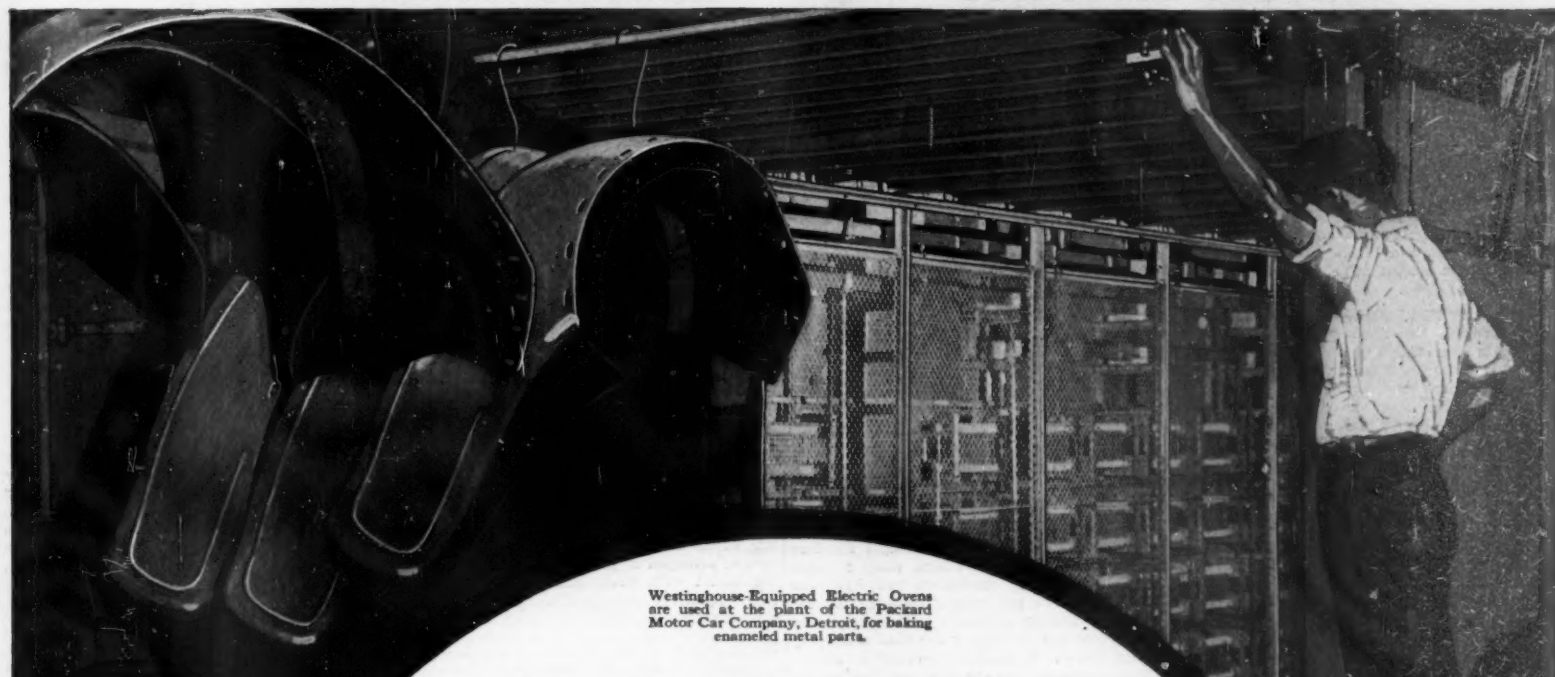
**INSTRUMENT FOR NAVIGATION AND LIKE PURPOSES.**—E. ZONA, Genoa, Italy. This invention refers to an instrument which permits of resolving in a quick and easy manner all those problems of plane navigation, the solution of which depends from the determination of the elements of a plane triangle; these solutions are obtained with the aid of a plane chart to which the instrument is applied, avoiding tracing on the same any construction lines which stain the paper, and may cause serious inconvenience.

**DOUBLE SWIVEL CONNECTING LINK FOR FISHING LINES.**—C. L. JOHNSON, 141 Bull St., Savannah, Ga. The invention relates generally to swivels for fishing lines utilized to connect the hook to one end of the line in such manner as to permit of free rotative movements. Among the objects is to provide an attacking swivel which is spring acting, having maximum strength in all parts, capable of ready and quick attachment, and disengagement both to the hook and to the end of the fishing line, and is particularly designed for use with the common form of hook, having its shank provided with a rigid eye.

(Continued on page 95)

# Westinghouse

ELECTRICAL APPARATUS FOR EVERY PURPOSE



Westinghouse-Equipped Electric Ovens are used at the plant of the Packard Motor Car Company, Detroit, for baking enameled metal parts.



## Getting Better Heat without Fire

Follow the growth of the motor-car industry, and you'll find that methods, processes, and machines have again and again been revolutionized by a single force—Electricity.

One improvement in electric lighting has followed close on the heels of another.

Product has been bettered and labor economized through electric drive.

New machines and time-saving improvements on existing ones became possible only through this universal force.

Today the span of improvement has widened to include an application of current as great as light and power—commercial electric heat.

Through this heat the motor-car

manufacturer finds the most satisfactory solution to his problem of enameling metal parts.

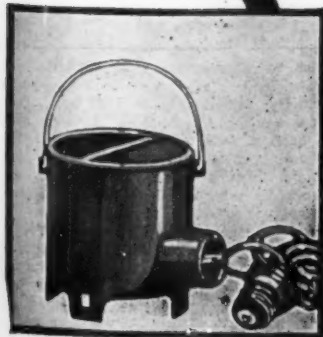
Through the use of electric heat he can be sure of an even temperature that bakes the enamel from the bottom, leaving it dense and free from blowholes.

Moreover, he minimizes fire risk and greatly reduces the time required for proper baking of enamel.

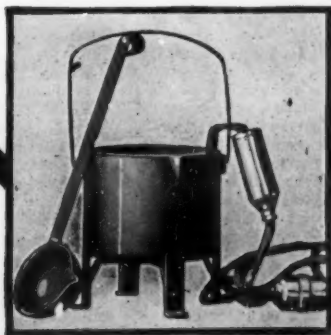
Electric heat is used today for a variety of commercial purposes in many branches of industry, but always retains its fundamental advantages of evenness, ease of regulation, cleanliness and safety.

The wide experience of Westinghouse industrial heating engineers is placed freely at your disposal.

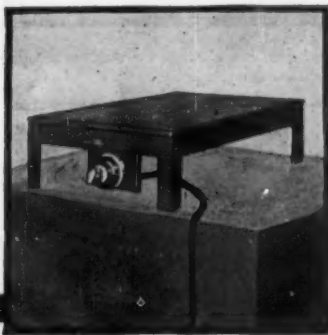
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY  
East Pittsburgh, Pa.



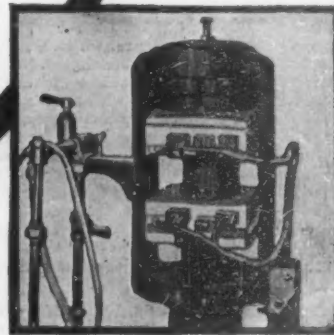
Electric Glue Pot keeps glue at proper heat



Electric Solder Pot combines safety with convenience



Hot Table used in making celluloid articles



Press for forming hot-molded compounds

## RECENTLY PATENTED INVENTIONS

(Continued from page 94)

**FASTENER.**—O. D. BELL, 217 Fenimore St., Brooklyn, N. Y. The invention while capable of other uses is more particularly intended for embodiment in a fastener for securing a button or loop to fur garments. With fasteners to which the invention particularly pertains, a tape or like flexible medium is employed and a coating fastener element; the general object is to provide a fastener element for the tape so formed that the tape may readily be passed through and above the fastener in such manner as to hold the button or loop securely and avoid the necessity of knotting or sewing the tape.

**Hardware and Tools**

**THUMB NUT SPANNER.**—G. BAEHR, Paris, France. This invention has for its object a thumb nut spanner it being possible to lock the spanner in any adjusted position; the device is characterized by the fact that the housing corresponding to the thumb nut is notably enlarged in order to accommodate the nose of a pawl pivoted on the handle, a helical spring surrounding the shank of the movable jaw, and bearing upon the thumb nut and upon a projection provided on each leg of the stationary jaw.

**WHIFFLETREE IRON.**—W. J. CASS, Easton, Me. This invention relates to draft appliances; its object is to provide a whiffletree iron arranged to provide a wearing member for the ring, link, cockeye or similar device used for receiving the end of the trace. Another object is to permit convenient detachment of the wearing member when worn out and replacing it by a new one. Another object is to provide a simple means for securely holding the wearing member in position on the whiffletree iron.

**SLIP SOCKET.**—A. M. MONROE, care Honolulu Consolidated Oil Co., Taft, Cal. The invention has for its object to provide a device especially adapted for use with fishing tools, for securing a firm grip on the tool, and which is automatically engaged with the tool. In use the



A LONGITUDINAL SECTION THROUGH THE SOCKET

device is lowered into the well casing, the upper broken end of the socket rod will be guided into the bore of the head by the flaring surfaces; when the fishing tool is drawn upward the tool will be held, the greater the pull the more tightly will the head section be compressed.

**Heating and Lighting**

**FURNACE.**—W. J. KENNEDY, 481 Garfield Ave., Jersey City, N. J. This invention has for an object the provision of a construction which utilizes to a maximum extent the heating value of the fuel by causing an absorption of the heat and a transmission of the heat. Another object is to provide a heating furnace for small or large houses with steam or hot water with the parts so constructed that the water is quickly heated and substantially super-heated as it leaves the furnace so as to be supplied to the radiators at a desirable temperature.

**Machines and Mechanical Devices**

**BOTTLE FILLING AND CORKING MACHINE.**—L. DAUM, 948 Brooklyn Ave., Brooklyn, N. Y. The invention relates to a machine for automatically filling and corking bottles. An object is to provide a machine particularly adaptable for filling bottles with liquids under reduced pressure. The machine comprises a trough having a side opening means for feeding bottles through the opening, a member mounted to slide in and out of the trough transversely of the opening means for moving the bottles within the trough intermittently, a filling device and means for bringing this device into engagement with the bottles, and means for corking the bottles in spaced relation to the filling means.

**OILING DEVICE.**—E. A. WINHOLT, 318 S. W. Grand Blvd., Springfield, Ill. This invention relates to mechanism for distributing liquids such as oil for general use, the particular object is to provide a liquid discharging receptacle of suitable

form adapted to be mounted in any one of different relations and supported in different ways for supplying liquid to machinery. The accumulation of liquid within the receptacle, and the periodic discharge being automatic and proportionate as near as practicable to actual need.

**HAND OPERATED GUMMED-BINDING SEALER.**—A. BERKOWITZ, 820 East 168th St., Bronx, N. Y. The invention relates to devices for automatically applying a gummed sealing label or strip to boxes, cartons, or other packages. Among the objects is to provide a hand operated machine carrying a roll of gummed binding and means for moistening the strip of binding as it is unrolled from the roll and applied to the package, the unrolling, moistening and pasting being accomplished by the simple movement of the device along the box or package.

**ROD PACKING.**—L. J. FARLAND and L. F. ROBERT, care of Ausable Supply Co., Au Sable Forks, N. Y. The invention relates to packing characterized by the provision of packing and packing supporting members which alternate and in which the supporting means help to lubricate the packing. An object is to provide a simple and efficient packing for rods, whether reciprocating or rotating, and one which can be easily and quickly removed or replaced.

**CLEANER FOR OFFSET-WINDING DRUMS OF PRINTING PRESSES.**—J. M. TRIER, 1022 Jackson Ave., Bronx, N. Y. Among the principal objects which the invention has in view are to remove from the rollers supporting and driving the offset drum deposits of ink transferred thereto from the offset web to avoid transferring to the offset web deposits of ink or other materials and to provide an apparatus for effecting these objects the construction and arrangement of which is simplified.

**ATTACHMENT FOR HYDRAULIC SYSTEMS.**—F. J. DAVIS, 100 Haight St., San Francisco, Cal. This invention while adapted for use generally in connection with hydraulic systems is more particularly designed for use with what is known as the telemotor, largely employed as operating gear for marine steering engines and in which accumulation of air results in lost motion in the operation of the steering gear, with a consequent improper working of the rudder. An object is to provide a valve controlling the escape of accumulated air and normally maintained closed by the liquid in the hydraulic system but adapted to automatically open by the presence of an air pocket at the valve.

**SLIP CRANK.**—W. F. MANGELS, West 8th St., Coney Island, N. Y. The object of the invention is to provide a slip crank arranged to prevent turning of the shaft in case of undue resistance against turning of the shaft. The present invention is intended for use in connection with the operating shaft of a machine gun but is not limited to this particular application and may be used on the shafts of spring motors and other devices and machines.

**Medical Devices**

**HOSPITAL MEDICINE TRAY.**—W. B. GRANT, 154 25th St., Elmhurst, L. I., N. Y. This invention relates to trays or carriers and has particular reference to trays or holders for a plurality of individual glasses, tumblers or the like. Among the objects is to provide a tray designed especially for use by a nurse in a hospital in her attendance upon a number of different patients to whom medicines of the like of different characters are to be administered in a safe, rapid and sanitary manner.

**STERILIZING APPARATUS FOR HYPODERMIC SYRINGES.**—H. R. FRANKLIN, Union Thermometer Co., 1301 Boston Rd., New York, N. Y. The invention has for its object to provide a sterilizing apparatus, which includes a carrier for supplanting the syringe and the needles in a case, it being possible to remove the carrier from the case body, remove the syringe and needles from the carrier, and dispose them in the case body, place alcohol in the cover of the case, dispose the carrier in the cover which serves as a support, and place water in the case body. The alcohol may then be ignited to sterilize the syringe and the needles.

**Prime Movers and Their Accessories**

**INTERNAL COMBUSTION ENGINE.**—O. S. PAYZANT, 63 Marble Hill Ave., New York, N. Y. The object of this invention is to provide a structure which is simple, and efficient, the full effect of each charge of explosive mixture being secured. Another object is to produce an engine in which the cylinders are thoroughly and completely scavenged, the scavenging section being associated with the driving shaft of the engine. A further object is to provide a rotary valve mechanism extending across the heads of all of the cylinders of the engine and connected up in such a manner as to provide a proper inlet and exhaust for the engine in proper time.

**Railways and Their Accessories**

**BOGIE FOR RAILWAY AND TRAMWAY VEHICLES.**—J. H. THOMAS, Medindie, South Australia, Australia. The invention relates to bogie for a railway or tramway vehicle made in two parts, each part carrying one of the axles and the two parts being held together by a vertical king pin passing through an eye in each of the two parts, such king pin being on one end of a link which has on its other end a second vertical pin that engages a beam secured to the frame of the vehicle body and holds a somewhat V-shaped beam upon the ends of which are two governor pins that engage and operate slidable governor blocks secured to the two parts of the bogies.

**TRAIN ORDER HOLDER.**—T. A. DAVIS, Medora, N. D. The object of this invention is to provide a device for holding the hoops by means of which train orders and the like are delivered to moving trains, in such a manner that the hoops may be easily caught by a trainman, either in the cab of the locomotive or in the caboose, without danger to the employees, and wherein the necessity of any one to hold the hoop on the platform is dispensed with.

**Pertaining to Recreation**

**TOY BOAT.**—O. E. WALL, Box 648, Honolulu, Territory of Hawaii. The invention has for its object to provide a toy boat having a propeller and a spring for driving the same, and having means for tensioning the spring, the boat having a spring controlled gun mounted on its deck, and means in connection with the gun and controlled by the tensioning of the spring for holding a projectile in the gun with the spring under compression, to release the projectile and spring when the spring is released.

**TOY CANNON.**—O. E. DROEGE and G. A. ROBINSON, 230 W. 123d St., New York, N. Y. The object of the invention is to provide a toy cannon arranged to permit of successive loading the barrel with projectiles from a magazine, ejecting such projectiles from the barrel, and simultaneously exploding percussion caps to simulate the action of a regular gun. Another object is to enable the user to accomplish this on turning a single crank thus simulating a rapid fire gun, and to accomplish the results by mechanism which is simple and durable in construction and not liable easily to get out of order.

**EXERCISER.**—A. A. HENDRICKSON, Elm St. and Second Ave., Westwood, N. J. The invention has for its object to provide an exerciser having coil springs through which extend safety or reinforcing cords, the terminals of the cords extending out of the terminals of the springs and being secured relatively to the springs, the cords at one set of the springs terminals extending beyond the points where they are secured and being connected with a wall fastener, which is supplementary to the wall fastener to which the springs are secured.

**GAME APPARATUS.**—D. M. MILLER, 189A Stockton St., Brooklyn, N. Y. The object of the invention is to provide a game apparatus especially designed for playing chess, checkers and like games, and arranged to take up very little space and thus permit of conveniently carrying the apparatus about. Another object is to render the game of chess highly interesting by discarding the old-fashioned figures and substituting therefor flat pieces of cardboard provided with representations of modern battle units and war paraphernalia.

**Pertaining to Vehicles**

**RIM AND TIRE.**—W. R. MILLER, 563 Fulton St., Elizabeth, N. J. The invention has for an object the provision of a construction securing the effect of an ordinary rim and the ordinary pneumatic tire without the disadvantage of the common pneumatic tire in respect to punctures, blowouts, and the like. A further object is the provision of a tire and rim structure wherein the tire is formed in sections and the rim is formed with openings through which the sections may be removed and replaced individually without disturbing the shoe or adjacent sections.

**SHADE FOR AUTOMOBILES.**—W. L. BESSOLO, Box 583, Walla Walla, Wash. The invention relates to a simple auxiliary shade or awning which is particularly adapted for the front seats of auto vehicles. The shade is intended for use in a case where it is not desired to raise the ordinary auto top, and it is adapted for attachment to the ordinary windshield frame and does not interfere with the ordinary top. It may be quickly put up and secured at different inclinations, and removed folded, and packed, when not required for use.

**FASTENING DEVICE.**—W. J. PUTNAM, General Delivery, Deposit, N. Y. The invention relates to a fastening device for connecting the ends of flexible members, as, for instance, the ends of cables used in holding upon a pneumatic tire the tire armor for protecting the tire. In this

construction the ends of the cable are clamped between the nut and body of a keeper. The arrangement of the ends of the cable looped and lying one upon the other and then clamped together, provides a connection that cannot be displaced under ordinary conditions.

**RADIUS ROD.**—R. F. SCALZI, care Warren St. Garage, Trenton, N. J. The invention relates to automobile frames. The foremost object being to provide an auxiliary radius rod, attachable either to automobiles generally in the process of manufacture, or to a well known type already in use, providing a brace for the front axle in addition to the radius rods already in use, to prevent distortion of the front axle. A further object is to provide radius rods which are normally separated to facilitate packing and shipping, and which are arranged for easy application to an automobile frame.

**DRIVING MECHANISM FOR HEAVY MECHANICALLY PROPELLED VEHICLES.**—W. G. WILSON, Farmingham, England. The object of this invention is to provide improved control of the track chains or driving wheels in use, providing a brace for the front axle in contact with the ground, the system employed being of the type in which the track chain wheels are driven by independent mechanism from a common shaft. Each mechanism involving the use of two brakes or a brake and a clutch or two clutches, the levers being connected in such a manner that while the controllers can be applied simultaneously, each can also be applied independently.

**SELF-PROPELLED VEHICLE.**—C. L. HEYERMANS, 17 Stanwick Rd., West Kensington, London, England. The invention relates to self-propelled vehicles such as motor cars, and more particularly cars of light construction, known as cycle cars. The principal object of the invention is to enable vehicles of light construction to be so built that they can be easily and rapidly taken to pieces and put together again, little space being occupied when they are taken to pieces, the engine being movable relatively to the main chassis.

**HOBBLE FOR MOTOR VEHICLES.**—J. J. McDade and F. P. DONNELLY, 42 Draper St., Dorchester, Mass. The object of the invention is to provide a device adapted to be locked upon the wheel of a motor vehicle, to lift the wheel once during each rotation thereof, to impart an uneven or hobbling motion to the vehicle, to add an unwonted or unusual condition in the



A PERSPECTIVE VIEW OF THE HOBBLE

vehicle, and to call attention to the same. The device is intended to be locked to the wheel as a safeguard, when the driver is to leave the vehicle for any length of time.

**SELECTIVE CONTROLLING MECHANISM.**—C. F. MARSTON, 2330 Tilden Ave., Brooklyn, N. Y. The object of the invention is to provide controlling mechanism more especially designed for use on automobiles and similar power-driven vehicles of the Ford or like type, arranged to enable the operator in charge to readily actuate the gear shifting or the brake mechanism by the use of a single pedal. Another object is to allow of applying the selective controlling mechanism of Ford cars as now constructed.

We wish to call attention to the fact that we are in a position to render competent services in every branch of patent or trade-mark work. Our staff is composed of mechanical, electrical and chemical experts, thoroughly trained to prepare and prosecute all patent applications, irrespective of the complex nature of the subject-matter involved, or of the specialized, technical or scientific knowledge required therefor.

We also have associates throughout the world, who assist in the prosecution of patent and trade-mark applications filed in all countries foreign to the United States.

MUNN & CO., Patent Attorneys.

233 Broadway, New York, N. Y.

Branch Offices: 625 F Street, Washington, D. C.  
801 Tower Bldg., Chicago, Ill.

### Binder Twine from the Desert

(Continued from page 83)

be converted into paper, which there is no reason to doubt, the importance of the discovery is beyond reckoning.

The yucca grows wild on the rock-covered mountainsides and deserts and semi-arid regions at almost any altitude in Arizona, Nevada, southern California, New Mexico and Mexico, and even extends into Central America. It thrives on decomposed granite and rears its stems where no other living thing can hold on. In the spring the heavy perfume of its countless spires of lovely creamy blossoms literally pervades the tens of thousands of square miles of its range like rich incense. Many of these attain a height of 15 to 20 feet. It may be safely said that there are few prettier, more fragrant or striking blooms on earth. Apparently it is increasing and spreading, whereas the sisal supply is reported slowly diminishing. And this material costs nothing aside from the gathering.

Harvesting yucca isn't a decidedly pleasant occupation, however. It is a disagreeable, obstinate article to handle. It jabs anyone who ventures within reach, and it carries poison on the keen tips of its hundreds of "bayonets" which causes painful sores. The present manufacturers obtain their supply now from a "forest" about 15 miles from Victorville, employing Mexicans, Negroes, mule teams and motor trucks in the cutting, bunching and assembling of the spines at shipping point. The cutting is done with long iron rods with sharp hooked blades on the end. As no leaves under 22 inches are taken the plant is not killed, and likely not even injured, so that another crop may be reaped the second year, though it will be much heavier the third. In many cases the plants branch freely and produce more spines after denudation than before.

### How Log Rafts Are Put Together and Launched

(Continued from page 83)

like a real ship, they are formed in huge cradles and then launched. In fact, the similarity between the raft cradle and the ship-building way is a striking one, as is well brought out in the picture showing the work of constructing the cradle.

The launching, while more or less along the lines followed in getting a ship overboard, presents some features peculiar to itself. There is no novelty in a broadside launch, since this method of getting large vessels into the water has long been practiced on the ground of the better distribution of strain which it effects. But the fact that the cradle in which the raft is constructed is actually floating on the surface of the water all the time makes it a comparatively simple matter to remove one of the sides that hold the raft in its place, and shove the latter off its temporary support. The raft goes overboard with a tremendous flop, but of course immediately rights itself and floats easily; and the cradle, after one or two heaves, likewise returns to an even keel. Then while one gang of workmen get along with the final touches necessary to put the raft in shape for its voyage, another crew is busily engaged in replacing the side of the cradle so that work may be begun without delay on another raft.

The method of construction outlined affords a very satisfactory answer to the question of how the big chains are got conveniently into place round the bundle of logs, and how the individual logs are held in place during the process of making them fast. At the same time it avoids all necessity for the use of any great amount of power in the launching, a necessity which would surely arise were the raft put up on dry land.

### Keeping the Big Guns at the Front Effective

(Continued from page 80)

versal milling machine, nine-inch and six-inch bench lathes, sensitive drill press,

16-inch shaper, 22½-inch drill press, 18-inch by 10-foot engine lathe, small arbor press, all of the above being motor-driven from the shop power plant. This is installed on a trailer and comprises two direct-connected gasoline-engine-driven generators, each of 15 kilowatts capacity, which supply power for the various machines as well as current for electric lights on all the trailers, for night repairs must be provided for.

There is also a trailer equipped with oxy-acetylene welding and cutting apparatus and a complete blacksmith equipment and are welding outfit. Six trailers are equipped as parts stockrooms, one being furnished with a bar-stock rack and hacksaw. The heavy baggage such as the tents and the rations is carried in a trailer with a plain body, while a standard quarter-master type of kitchen trailer is also provided.

The equipment indicates the general nature of the work that the heavy artillery ordnance mobile repair shop can handle and its general usefulness. Of course guns cannot be relined, but many extensive repairs to breech blocks, and carriage mechanism, as well as to the various tractors and tanks, can be accomplished, making it unnecessary to send a piece or vehicle for a long road or railway journey over congested lines of communication to the base ordnance shops in the rear. The four-ton crane permitted the dismantling of cannon and the handing of the heavier parts.

### A Tractor Designed for Power Economy

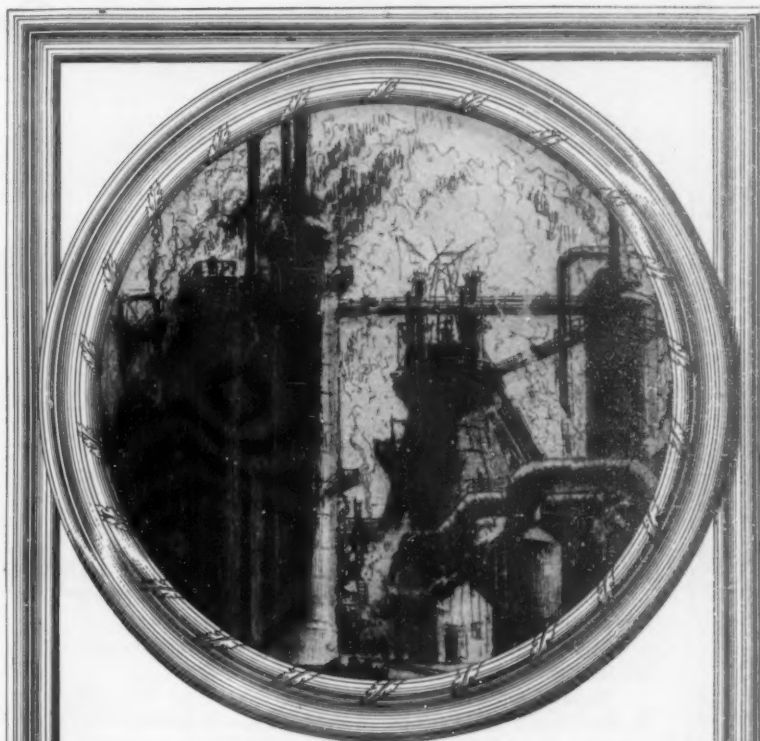
(Continued from page 80)

construction of this tractor. The shocks of starting and stopping—the shocks encountered when inequality of soil is encountered—the shocks which occur when running over hard ground—the shocks occasioned by the pull of the plow or other implements; all these are absorbed by means of spring cushions.

The man who drives a tractor all day cannot work efficiently if he is held in one position, or in a cramped position, so that he cannot move about freely, or if a great amount of effort is required to handle the tractor. An extra roomy platform with room enough for two or three men is therefore provided; a roomy, easy-riding spring-steel seat gives comfort to the operator. The steering of the machine is as easily accomplished as that of an automobile.

The transmission is of selective type and is entirely enclosed. The two crossover gears are placed on the outside of the transmission housing and completely enclosed by an easily removable cover provided for lubrication and protection. The position of the crossgears gives two speeds forward, 2½ and 3½ miles per hour and one speed reverse. For exceptionally heavy duty or drag work, gears may be reversed in position which reduces the speeds forward to 1½ and 2½ miles per hour, thus greatly increasing the horsepower at the drawbar. In case speeds greater than 3½ miles per hour are required for road or special work, special gears may be provided which will increase the speed of the tractor to any speed up to 15 miles per hour. The crossover gears may be interchanged in five minutes with a wrench and screwdriver, even by an unskilled person.

The planetary live-axle spur-gear drive is also designed to reduce friction to a minimum and to deliver maximum engine power to the drawbar. This planetary axle drive is engaged at all times at three points of contact inwardly and outwardly, instead of making the speed reduction through a single gear engaged at one point only as is the case where driving pinion and bull gears are employed to act as a final drive. This planetary drive reduces wear, minimizes the chance of stripping gear teeth and delivers the engine power to the drawbar with a minimum loss.



## Spicer

### UNIVERSAL JOINTS AND PROPELLER SHAFTS

FROM the great mills of Pennsylvania comes the steel for SPICER UNIVERSAL JOINTS and PROPELLER SHAFTS.

The entire driving load of your car falls upon the propeller shaft. Sudden stresses wrench and rack it—stresses which only the strongest of steel can resist.

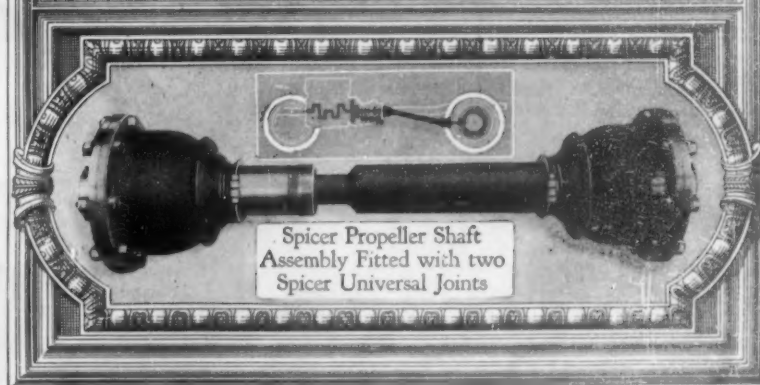
Since 1904 SPICER PROPELLER SHAFTS have served quietly, efficiently, enduringly—outlasting the finest cars.

Today more than one hundred of the leading makes of motor vehicles are SPICER-equipped.

*Every genuine SPICER UNIVERSAL JOINT bears the SPICER name on the edge of the flange.*

**SPICER MFG. CORPORATION**  
SOUTH PLAINFIELD, N. J.

*Blast Furnaces, Bethlehem, Pa.:  
The first chapter in the story of  
the SPICER UNIVERSAL JOINT.*



Spicer Propeller Shaft  
Assembly Fitted with two  
Spicer Universal Joints



### Williams' "Agrippa" Turning-Tool Holders "The Holders That Hold"

WILLIAMS' "Agrippa" Tool Holders offer unusual variety of types and sizes for all regular machining operations.

In Turning-tools, the Set Screw Pattern is designed for those using cutters made of steel which has been hammered, or rolled, with a greater variation in size than is common to usual mill practice.

The Cam Pattern, for cutters of accurate size, provides greater strength and reliability than any other type of cutter-fastening.

Both patterns are illustrated above; both are made with right and left hand offset and straight shanks.

These tools measure up to the high standard of Williams' Superior Drop-Forgings and are unexcelled in quality and efficiency. They are absolutely dependable and are unconditionally guaranteed.

May we send you a copy of our Machinists' Tools Booklet?

**J. H. WILLIAMS & CO.**  
"The Drop-Forging People"

Western Office and Warehouse:  
28 So. Clinton Street  
Chicago, Ill.

General Offices:  
28 Richards Street  
Brooklyn, N. Y.

## BUBBLING FOUNTAINS

FOR ATTACHMENT TO MUNICIPAL SUPPLY

**Unequalled Keith Bubbler Unless otherwise specified.**  
This cut shows our No. 604—15 lbs. of iron—cast iron—15 1/2 lbs. of 1 1/2 in. brass tubing—No. 22 Gauge. Thorough workmanship—selected materials—tested and adopted by those whose judgment is unquestioned.

Our lines include: Sanitary Wash Basins (on Batteries), Bubbling Fountains (plain and ice cooled), Metal Lockers, Metal Bench and Pattern Storage Racks, Metal Shelving, Metal Cabinets, Vault Fixtures, Soda Kettles (40 and 60 gallons), Metal Stools and Chairs, Water Mixers, Work Benches, Bench Legs, Full line of Plumbing Fixtures, etc.

Many types and sizes. May have coil on bottom as well as on sides. Tasty—convenient—and efficient. Very attractive appearance.

Olive brown baked enamel finish—Pure white vitreous cast iron enameled bowl. Fittings—nickel-plated. Wastes above or below the floor.

Send for list of users Many thousand in use

**The Best is the Cheapest**

**M&Eco**  
Metal Equipment Factory  
For Shop and Factory

Write and mail address  
Framingham, Mass.  
186 Federal Street  
Boston, Mass.

Manufacturing Equipment and Engineering Co.

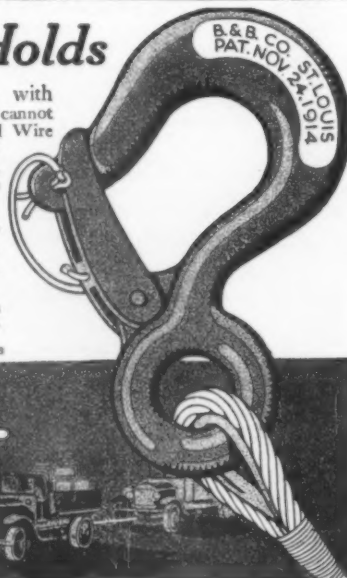
## The Hook that Holds

Here is POWERSTEEL TRUCKLINE with patented Snaffle Hook. Attaches instantly and cannot loosen. Combined with famous Yellow Strand Wire Rope, it makes a truckline that's dependable under the heaviest strains. Also made with plain hook. Retails, east of Rockies, at \$11.30 with plain hook; \$12.75 with Snaffle Hooks.

BASLINE AUTOWLINE is a smaller line for passenger cars. At dealers, \$5.80 east of Rockies. POWERSTEEL AUTOWLOCK foils car and tire thief. At dealers, \$2.35 east of Rockies.

BRODERICK & BASCOM ROPE CO., ST. LOUIS  
Manufacturers of Celebrated Yellow Strand Wire Rope—Now Helping in World Reconstruction

# POWERSTEEL TRUCKLINE



## A Naval Land Gun

(Continued from page 91)

place heavy reinforcing girders on the roadbed to absorb the shock of firing, as the guns were mounted without any provision for absorbing the recoil and lessening the reaction on the gun girders and the roadbed. Many thought and frankly stated it was impossible to design a gun that would fire at maximum elevation directly from a railroad track and be ready in any emergency.

As usual in the war, the man who said it couldn't be done was interrupted by the man who was doing it. Designs for a new monster gun car were commenced by the Bureau of Ordnance at the Naval Gun Factory in September, 1918, were completed in record time and a number of the cars themselves were under construction when the armistice was signed. Two of these cars were so far along when the armistice was signed that it was found more economical to go ahead and complete them than to cancel the orders. Had the war continued, they would all have been finished long before this, but with the slowing down of work on war material, it took some months longer than originally scheduled to erect them. The first of these cars was exhibited to the public at the Master Car Builders' Convention, held in Atlantic City, N. J., June 18th to 25th, 1919, it being regarded as a masterpiece of car building.

This new railway gun car mounts a 14-inch, 50-caliber naval rifle which can fire at any elevation up to 45 degrees with a corresponding maximum range of 53,000 yards, or about 30 miles. The gun is supported between two enormous bridge girders, 94 feet long and 10 feet high, and weighing 40 tons each, the complete girder unit weighing 80 tons. Two massive steel plates fitted to the inner sides of the girders carry the 95-ton gun with its slide and recoil mechanism.

The 14-inch, 50-caliber gun is 50 x 14 inches or 700 inches long. This is equal to 58 1/2 feet, and in order to balance the gun when in the slide which holds it, the axis of the trunnions is placed 17 feet from the breech. On firing, the gun recoils in its slide a distance of 44 inches, so that a clear space of about 21 feet in rear of the trunnions is necessary to enable the gun to fire. To give the gun an elevation of 45 degrees and allow for necessary clearance the trunnions must therefore be located about 16 feet above the rails. The top of the gun when horizontal then comes about 19 feet above the rails.

Now French tunnels are only 14 feet high (American tunnels are slightly higher). The Navy designers had to find a way of getting a 19-foot car through a 14-foot hole. They solved the problem by making the gun literally "crawl into its shell" when it has to travel over the railroads, crawling out again when it stops at the firing point.

The method of accomplishing this is as follows: The gun, its slide, elevating gear and the supporting plates, castings and braces are built into a single unit weighing some 160 tons and held by guides on the inner sides of the girders. When traveling, the entire unit is housed between the girders. In order to fire, the 160-ton unit is pushed up along the guides, at an angle of 45 degrees, for a distance of about seven feet by hydraulic power, and then locked into position by two heavy lugs. This raises the trunnions a vertical distance of about five feet. To change from traveling to firing position takes about six minutes' time. Power for raising the gun is supplied by a gasoline-engine-driven hydraulic pump located under the forward end of the gun car, where it cannot be struck by fragments of enemy shells when the gun is in action.

All the structural framework on the top of the gun girder at the breech of the gun is readily detachable so that nothing projects above the top of the girder when the gun is in traveling position, except the recoil cylinders of the gun slide.

## LEGAL NOTICES

### PATENTS

IF YOU HAVE AN INVENTION which you wish to patent you can write fully and freely to Munn & Co. for advice in regard to the best way of obtaining protection. Please send sketches or a model of your invention and a description of the device, explaining its operation.

All communications are strictly confidential. Our vast practice, extending over a period of seventy years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Handbook on Patents is sent free on request. This explains our methods, terms, etc., in regard to Patents, Trade Marks, Foreign Patents, etc.

**SCIENTIFIC AMERICAN**  
contains Patent Office Notes. Decisions of interest to inventors—and particulars of recently patented inventions.

**MUNN & CO., SOLICITORS OF PATENTS**  
626 Woolworth Bldg., NEW YORK and 625 F Street, WASHINGTON, D. C.  
801 Tower Bldg., CHICAGO, ILL.

### Annual Subscription Rates

#### Scientific American Publications

Scientific American (established 1845) one year \$5.00  
Scientific American Supplement (established 1876) one year 5.00

Postage prepaid in United States and possessions, Mexico, Cuba and Panama

#### Foreign Postage

Scientific American \$1.50 per year additional.  
Scientific American Supplement \$1.00 per year additional.

#### Canadian Postage

Scientific American 75c per year additional.  
Scientific American Supplement 50c per year additional.

The combined subscription rates and rates to foreign countries, including Canada, will be furnished upon application.

Remit by postal or express money order, bank draft or check

## Classified Advertisements

Advertising in this column is \$1.00 a line. No less than four nor more than 12 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance.

### METALS WANTED

FOR THE HIGHEST PRICES send us scrap platinum in any form, mercury, magnetite, ores and amalgams, watches, false teeth, diamonds—anything valuable. Goods returned if our price is not O.K. Ohio Smelting & Refining Company, 24 Lennox Building, Cleveland, Ohio.

### BUSINESS OPPORTUNITIES

SUBSTANTIAL Manufacturing Corporation wants capable men to establish branch and manage salesmen. \$500 to \$1500 necessary. Will allow expenses to Baltimore as explained. Address, Treasurer, 416 N. Howard St., Baltimore, Md.

### WANTED

THE exclusive manufacturing rights of some machine, device, or article in the metal line—patented or otherwise, by one of the most completely equipped manufacturing plants in Indiana. Address: W. M. F., P. O. Box No. 263, Bedford, Indiana.

### INVENTIONS

HAVE you a practical invention to sell outright or place on royalty? Send details to Adam Fisher Mfg. Co., 78, St. Louis, Mo.

**SOLVINE BOILER PRESERVER**  
Warranted, without reserve, to remove boiler scale prevent pitting and scale formation.  
Pamphlet on request. Money back guarantee.  
SOLVINE MFG. CO. Jersey City, N. J.

**ICE MACHINES** Corliss Engines, Brewers and Bottlers' Machinery  
**The VILTER MFG. CO.**  
899 Clinton Street Milwaukee, Wis.

**THE BRIDGEPORT CHAIN CO.**  
Specialists in Small Wire Shapes & Flat Stampings  
Bridgeport, Conn.

## A 96-PAGE CATALOGUE

OF  
**Scientific and  
Technical Books**

listing 2500 titles on 500 subjects, may be secured by addressing

**SCIENTIFIC AMERICAN  
PUBLISHING CO.**  
Woolworth Bldg., New York

A detachable armor plate cab will be provided for protecting the gun from enemy shell-fire if it is found that the guns are to operate on land against objectives as did the original U. S. Naval Railway Batteries.

An air compressor for supplying compressed air to the gun, for closing the breech, assisting in bringing the gun back to battery after firing, and for the ejection of powder gases after each shot, and a winch are located over the front trucks.

Completely equipped, the gun car weighs about 320 tons. It is supported on two pairs of 20-wheeled trucks, making a total of 40 wheels. Although over 130 feet long, it can travel any railroad, around any curve or on any bridge over which a standard freight locomotive is able to pass.

In operation, this gun car will be provided with at least one ammunition car which will be coupled directly to the gun car. The 1,400-pound shells and the 400-pound powder charges will then be rolled on a monorail car from the ammunition car to the gun car, and will be picked up and loaded directly into the gun. The gun will be loaded with the muzzle slightly depressed in order to facilitate seating of the shell. Elevating will be done by hand, wheels being provided on either side of the gun car for this purpose. The gun is so well balanced that one man can easily elevate it.

Although the war is over, and they are now not needed for shooting up "Hun" railroad lines and fortifications, these guns will be extremely valuable for coast defense. Should an enemy appear off either of our coasts, word can be flashed to the commanding officer of one of these traveling land batteries, and the gun can start as soon as a locomotive can be hooked to it. It can make the transcontinental trip in a week's time. The gun will fire from curved sidings placed at points of vantage along the coast. Its fire will be at least as accurate as any from an enemy ship, and will by far outrange the guns of any ship now afloat. These same 14-inch guns have proved, during long operation in France, that they are the most accurate long-range guns in the world, and that, with proper airplane observation of their shooting, they can readily reach and demolish their target.

### Does Plate Glass Fade?

SEVERAL years ago a contract was taken to supply a vertical installation of prisms in a store front of a haberdasher in the main business thoroughfare of Indianapolis, Ind. To install the prisms properly it was found necessary to cut off five feet from the top part of the plate glass, which had been in position for a number of years and exposed to the sun's rays during much of the time.

After the prisms had been installed the five-foot piece of plate glass salvaged was thoroughly cleaned and polished and consigned to stock for resale. In the course of time this salvage piece of glass was sold, to be used in a front window of a new residence in one of the principal streets in the fashionable residence section. The house was completed and the owner, having taken possession, was thoroughly enjoying the sensations of the new home, when the family began to receive telephone calls of a rather puzzling and perplexing nature, asking the price and how quickly delivery could be effected in various quantities of *Shirts Made to Order*. A certain wag in the community called up the owner, complaining that he, the owner, had made a mistake in building a shirt factory in that neighborhood, and that if he persisted in operating a factory in his residence, in all fairness and consideration to his new neighbors, he should at least remove all advertising from his front window.

The daughter of the house becoming thoroughly aggravated and annoyed at what she presumed was a practical joke of some sort, proceeded to make an investi-

gation on her own account, which resulted in the writer being requested to call at the house. He was greeted at the front door by Mr. Owner and asked whether the plate glass furnished was really first grade or second handed? To the reply that, from a close inspection at that moment, it was a beautifully polished high grade piece of plate, and to all appearances, absolutely without blemish, he assumed a peculiar knowing smile and asked me to walk down the street with him a short distance; turning abruptly at perhaps fifty paces, he asked me to look at the window. To my astonishment plainly legible at the particular angle, at which we stood, were the words: JOHN DOE—SHIRTS MADE TO ORDER.

What seemed to be a phenomenon was easily explained. Previous to the plate glass being removed from the show window of the haberdasher, there had been pasted white enameled letters, "John Doe—Shirts Made to Order." These letters being subjected to the direct rays of the sun for a period of years had prevented the fading of the glass (originally green) to a clear white as was the case with that portion which was not immediately back of the opaque enameled letters. The unfaded portion consequently stood out in contrast in its original green, but was not discernable, except at a certain angle.

### How Do Rats Carry Eggs?

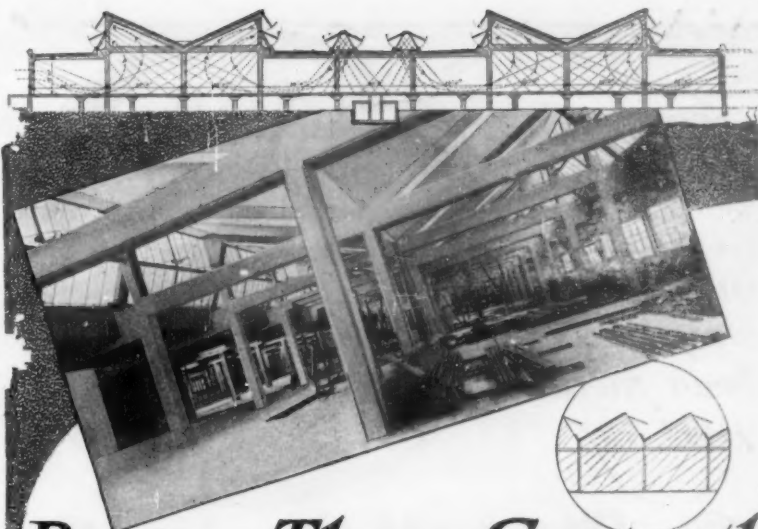
THIS is a mystery enacted, in one form or another, annually on thousands of farms, and sometimes even in city homes. The housewife has an accumulation of eggs ready to go to market. They partially fill a wooden crock, set on a box in the cellar. One evening the contents are intact; the next day they have vanished, with not a sign to indicate where or how they have gone.

Or maybe the farm-boy has a hen setting on 15 eggs, in a box high up from the floor. He finds the hen off after several days, and casually counts the eggs. Two are gone. Critically examining the nesting materials, he finds no indication that the hen has broken the eggs. The following day he finds a third egg vanished, the second day, two others gone. Then, suddenly, the trusted broody hen leaves her nest, "broken up." Rats? It doesn't seem possible, yet the farm-boy knows the explanation really is rats. They have been practicing such magic in the poultry-house for generations.

How do rats carry eggs? Some time ago the query was put to the most famous of all American naturalists, John Burroughs. He admitted that he didn't know. He had heard an explanation, current among farmers, but he couldn't say that it was the correct one.

The mystery of how rats carry eggs is unsolved "officially" after hundreds of years of conjecture. That eggs disappearing are borne off by rats is proved clearly enough by the discovery of whole, uncracked eggs beneath floors, in partitions, and other hiding places. In farming communities various theories are advanced and every now and then some one actually claims to have seen the rats at work. These eye-witnesses of a most unusual thing say the rat holds the egg between chin and forefeet, or hugged tightly between the forefeet; that he tumbles off elevations deftly protecting the egg as he falls; that usually there is a crowd of rats about to drag the egg rat, lying on its back, by the tail across the floor to the hole.

Others say the rat carries the egg, held between folds of skin under the chin, without assistance. The general testimony, however, would explain such a conflict of opinion. It is agreed that rats work in gangs when egg-carrying, and that it is difficult to determine from a distance exactly what they are doing among themselves. It is said there is always much squealing, but whether because some are getting hurt, or by contrast are hugely enjoying themselves, is not indicated.



## Better Than Sawtooth —Costs Less

The wider the building, the less satisfactory is a sawtooth roof. Every object under it has a light side and a shadow side. The glare when facing the sash is so harsh that workers are placed with their backs to it where possible.

Ventilation is also poor, as very little fresh air reaches the central area. Substitute for the sawtooth a

## Pond Truss

PATENTED  
THE ROOF THAT VENTILATES

and an actually smaller sash area will give better lighting, because the light enters from all directions, hence glare and harsh contrasts are avoided.

Ventilation is effective also, because the roof tends directly to draw air to the center.

For general manufacturing the roof need not be high. If the building is very wide two or more Pond Trusses may be used, with inlets for air and light at low points in the roof between them.

We invented the Pond Truss to get maximum results from POND CONTINUOUS SASH. It is patented: we license its use where Lupton Products are used in the same building.

Our Service Department will gladly co-operate with your architect or engineer. We design every Pond Truss roof to fit the special requirements of the case.

Write for booklet, "Air, Light and Efficiency"

### DAVID LUPTON'S SONS COMPANY

Clearfield & Weikel Sts.

Philadelphia, Pa.

Makers of modern equipment for daylighting and natural ventilation  
Canadian Mfrs.: The A. B. ORMSEY CO., LTD., Toronto

The illustrations show main manufacturing building of Dayton-Wright Airplane Co. Messrs. Schenck & Williams, Architects; Mr. O. Kressler, Plant Engineer.

Size 270 x 1000 feet. Will eventually be 370 feet wide. Roof has two Pond Trusses, with Pond A frames between Pond Continuous Sash used in all roof openings

Pond Continuous Sash for Pond Truss, sawtooths, monitors and side walls  
Pond Operating Device for long lines of sash  
Lupton Rolled Steel Skylight

Lupton Steel Sash  
Pivoted Factory Type  
Counterbalanced Type  
Counterweighted Type  
Lupton Steel Partition and Doors

# Lupton

INVESTMENT VALUE

**Monarch Lathes**  
Quantity production of a high class machine tool has made possible the low price of MONARCH Lathes.  
Made up to 20 ft. swing. Every one guaranteed to give satisfaction to the purchaser. There is a Monarch lathe to meet your needs. Write for a catalogue.

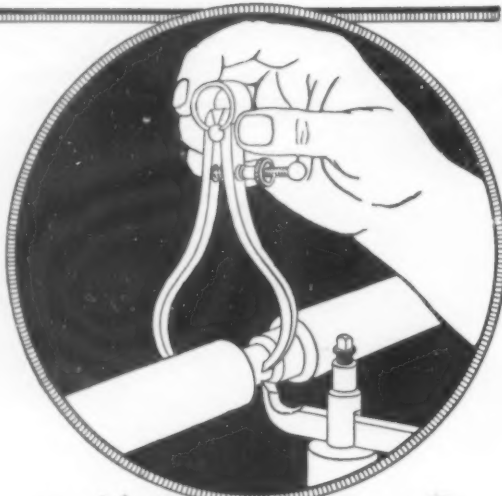
**The Monarch Machine Tool Co.**  
—America's Largest Lathe Builders—  
105 Oak Street Sidney, Ohio

**ECONOMY**  
renewable FUSES

insure maximum safety and minimum cost in safeguarding electrical circuits against the fire and accident hazards of overloads and short circuits. An inexpensive "Drop Out" Renewal Link restores a blown Economy Fuse to its original efficiency. The Economy is a pioneer renewable fuse. As compared with the use of one-time fuses, it cuts annual fuse maintenance costs approximately 80 per cent.

**ECONOMY FUSE & MFG. CO.**  
Waukegan and Orleans Sts. CHICAGO, U. S. A.  
Sole manufacturers of "RENEWABLE" type Renewable Fuse with the 100% Guarantee. In all states, Economy Fuses are also made in Canada at Montreal.

for  
39 Years,  
accuracy  
in machine  
shops has  
been meas-  
ured by



**Starrett Tools**

### The Design and Construction of Induction Coils

By A. FREDERICK COLLINS

6 1/2 x 9 1/4 inches. Cloth. 272 pages. 159 illustrations. \$3.50; by mail, \$3.65

This work gives in minute details full practical directions for making eight different sizes of coils varying from a small one giving a 1/2-inch spark to a large one giving 12-inch sparks. The dimensions of each and every part are given and the descriptions are written in language easy comprehension.

Scientific American Publishing Co.  
Woolworth Building New York City

## DURAND STEEL LOCKERS



### Are You Proud of Your Plant?

If you are not, you may be sure that your employees are not.

And they ought to be—if they are to put the spirit into their work that spells success for you.

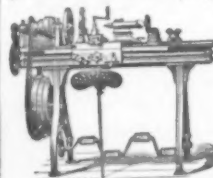
Better lighting, heating, and ventilation; better sanitation; bonus and profit-sharing systems, are some of the means used to foster this spirit today.

And Durand Steel Lockers.

Write for Catalogue of steel lockers, or of steel racks, bins and counters, etc.

DURAND STEEL LOCKER CO.  
1574 Ft. Dearborn Bldg. Chicago 974 Vanderbilt Bldg. New York

### For Gunsmiths, Tool Makers, Experimental & Repair Work, etc.



From 9-in. to 18-in. swing. Arranged for Steam or Foot Power, Velocipede or Stand-up Treadle.

W. F. & J. Barnes Co.  
Established 1872.  
1999 Ruby Street  
Rockford, Ill.

### SOUTH BEND LATHES

Established in 1906 Over 20,000 South Bend Lathes in use

For the Machine and Repair Shop

LOW IN PRICE

12 in. to 24 in. swing

Straight or Gap Bed

Send for free catalogue giving prices on entire line

South Bend Lathe Works

421 Madison St., South Bend, Ind.

### If Horace Greeley Were Alive Today

Would he advise young men to go West, or would he advise them to take advantage of the opportunities that abound in their immediate vicinity—"Knocking at their door" as the saying goes. Undoubtedly he would tell them that everywhere in this big and prosperous country there is opportunity for the young man who will use his brains, acquire knowledge, and get busy.

Let me tell you of at least one opportunity right in your own town.

Business Manager  
**SCIENTIFIC AMERICAN**  
Room 676  
Woolworth Building New York City

### NEW BOOKS, ETC.

**MANAGEMENT AND MEN.** A Record of New Steps in Industrial Relations. By Meyer Bloomfield. New York: The Century Company, 1919. 8vo.; 591 pp.

Both employers and workers consult the author on vital questions: he acted as organizer for the Shipping Board; he is a pioneer in modern methods of handling personnel; and, finally, in 1918, he went to England to observe at first hand the strides being made there toward amicable and satisfactory solutions of labor problems, and embodied these observations in the present unique and valuable work. Our employers, labor representatives, and students of industrial conditions may gain light from this book that will enable them to substitute broad-gauge thought and action for a policy of drift: it should do much toward bringing capital and labor into closer and more sympathetic relationship.

**MARIE BASHKIRTSEFF.** The Journal of a Young Artist, 1860-1884. Translated by Mary J. Serrano. New York: E. P. Dutton and Company. 8vo.

This is a new, revised edition of the book that created so favorable an impression on its first appearance in English. In it a young artist of typically Russian mentality so expresses her reactions to life in its varied aspects of science, art, literature, and love, as to force from Gladstone the tribute that it is "a record of an extraordinary life—a book without a parallel."

**PRINCIPLES OF DIRECT CURRENT ENGINEERING.** By James R. Barr, A. M. I. E. E. New York: Isaac Pitman and Sons. 8vo.; 551 pp.; illustrated.

The intermediate class-work of the university and technical college calls for a textbook that spans the interspace between elementary manuals and specializing works. Such a text should lay open fundamental principles and illustrate how they are turned to utilitarian ends. These requirements are kept in mind by the author, and his descriptions of apparatus and machines embody the practice of the day in Great Britain. In the diagrams of such devices as armature windings and switchboard connections, colored ink has been used to facilitate a quick grasp of distinctions, and the folding inserts offer appreciable advantages.

**MANUAL OF THE CHEMICAL ANALYSIS OF ROCKS.** By Henry S. Washington, Ph.D. New York: John Wiley and Sons, Inc., 1919. 8vo.; 271 pp.; frontispiece.

This manual presents a good selection of methods in the chemical analysis of silicate rocks, for the particular benefit of those mining engineers, chemists, and petrologists who are not experts in quantitative analysis. These simple, reliable methods, collected into one volume, have proved acceptable to many students, and the new edition with its careful revision and added material, in which the treatment is more detailed and greater emphasis laid on sources of error, should meet the requirements of those who have but a somewhat superficial acquaintance with this branch of the subject.

**LIQUID FUELS FOR INTERNAL COMBUSTION ENGINES.** A Practical Treatise for Engineers and Chemists. By Harold Moore, M.Sc. Tech., F.C.S. New York: D. Van Nostrand Company, 1918. 8vo.; 200 pp.; illustrated.

There is still much room for improvement in the manner of using liquid fuels in internal combustion engines, and the investigation offers a fruitful field. This work briefly explains chemical differences and constitutes an introduction to the intricate problems of examination and valuation of such fuels: it should stimulate and aid experimental work in this direction. Part I deals with the bases and their products, Part II with carburetor, vaporizer, and atomizer systems, and Part III with the examination of liquid fuels and calorimetry. The book is of British origin.

**CONCRETE-STEEL CONSTRUCTION.** Part I.—Buildings. By Henry T. Eddy, C.E., Sc.D., and C. A. P. Turner, C.E. Minneapolis: H. T. Eddy and C. A. P. Turner, 1919. 8vo.; 200 pp.; illustrated.

Practice has outrun theory in concrete construction. The tensile strength of concrete is ignored in building code regulations, yet precise tests show this material actually resisting, under certain conditions, three-fourths of the bending moment. The authors aim to bring theory into accordance with fact by a mathematical treatment based on experiments. Current misconceptions are corrected, and a recognition of the principles elucidated would result in great saving of material and cost in fireproof construction and, indirectly, in a considerable reduction in fire losses.

**BUREAU OF AMERICAN ETHNOLOGY.** Thirty-second Annual Report, 1910-1911. Washington: Government Printing Office, 1918. 8vo.; 819 pp.

The report chronicles, as usual, the Bureau's activities for the year, covering systematic and special researches and listing the bulletins issued. The interest of the volume culminates, for ethnologist and general reader, in the "accompanying paper" of nearly 800 pages, dealing at remarkable length with Seneca fiction, legends and myths—an exhaustive study by Jeremiah Curtin and J. N. B. Hewitt. A portion of this material is in the Seneca dialect, interlined by a literal translation, thus affording an insight into the grammar and construction of the dialect. The stories evidence a high moral tone in striking contradiction to the prevalent belief in their coarseness.

**FOUNDATIONS OF CHEMISTRY.** By Arthur A. Blanchard, Ph.D. and Frank B. Wade, B.S. New York: American Book Company. 8vo.; 446 pp.; illustrated.

In secondary school education the trend of the day is toward practicality; in this text, the extremes of the tendency are avoided, and broad, underlying principles are stressed; at the same time their applications to industrial processes are freely used as illustrative material. Scientific habits of thought are fostered, and there is logical progression from simple to complex. In the chapters relating to food chemistry and metallurgy the assistance of specialists was secured. An accompanying laboratory manual contains 95 experiments, and the loose-leaf construction adds to its handiness.

**THE EROTIC MOTIVE IN LITERATURE.** By Albert Mordell. New York: Boni and Liveright, 1919. 8vo.; 250 pp.

These papers are adventures in psychoanalysis as applied to authors and their works with their ultra-intimate discussions of our literary geniuses, they offer a delightful hour to the book lover. They form, however, a series of interpretations that seldom attain demonstration, and that often go afled for a complex explanation when a simpler one is at hand. Physiological factors are ignored; and so long as body and mind, like the hen and the egg in the old question, dispute for precedence, this is injudicious; and in gazing into the depths, the extreme Freudian is likely to lose his head and his footing. This is only saying that new discoveries always tend toward mental levitation, and it in nowise detracts from the human and literary interest and valuable qualities of Mr. Mordell's work.

**PRINCIPLES OF FOREIGN TRADE.** By Norbert Savay, A.M., LL.B. New York: Ronald Press Company. 8vo.; 495 pp.

For those already in foreign trade, or for those who would become familiar with this field, Norbert Savay's new work is a detailed and illuminating study. It throws open the sources of information here and abroad, reviews the subject from all angles—economic, marketing, legal, shipping, and banking—and tells how the foreign trader trains his men and manages his business. It sketches the policies of various nations, and fully discloses the exact points which it is necessary for the merchant and manufacturer to master. It is a comprehensive work that is built up from basic principles to technical details.

**FACTS AND FALLACIES OF COMPULSORY HEALTH INSURANCE.** FAILURE OF GERMAN COMPULSORY HEALTH INSURANCE—A WAR REVELATION. AUTOCRACY AND PATERNALISM VS. DEMOCRACY AND LIBERTY. ARMY ANTHROPOMETRY AND MEDICAL REJECTION STATISTICS. A PLAN FOR A MORE EFFECTIVE FEDERAL AND STATE HEALTH ADMINISTRATION. Five booklets by Frederick L. Hoffman, LL.D. Newark, N. J.: Prudential Press. 8vo.; paper.

These booklets by the statistician of one of our largest life insurance companies bring together in accessible form facts, figures, and deductions having a distinct bearing upon national health and happiness. Available statistics still seem at times inadequate for satisfactory conclusions: in "Facts and Fallacies of Compulsory Health Insurance," for example, the table showing the comparative expectation of life for the United States, England and Germany would be more convincing if the periods of time dealt with coincided; and the stationary death rate and increasing suicide rate of Berlin may mean, not that compulsory insurance has no beneficial or restraining influence, but that other and stronger factors determine the situation. On the whole, the papers reveal knowledge and research, and present strong arguments in support of their contentions. "A Plan for a More Effective Federal and State Health Administration" contains suggestions worthy of close attention.

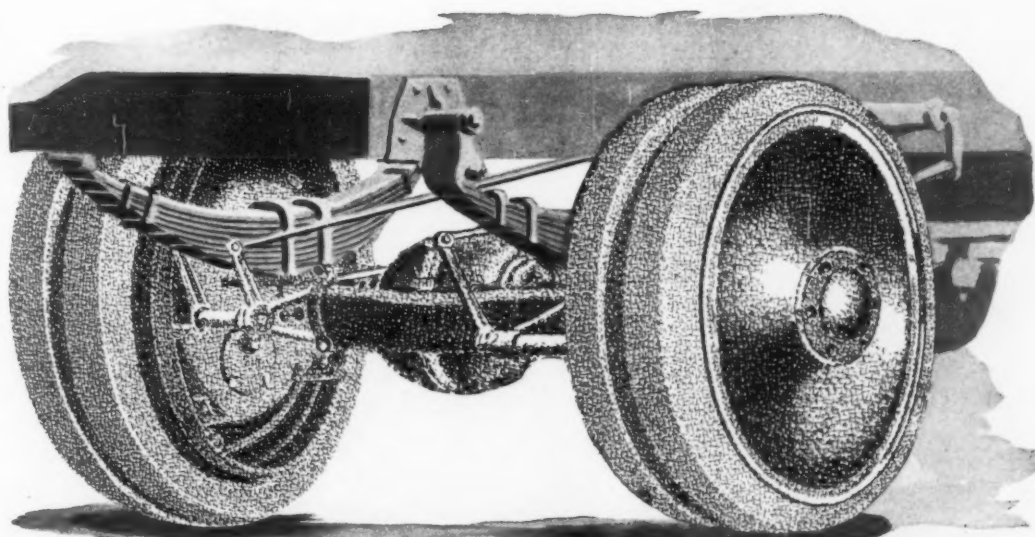


Clark Internal Gear Axles  
have exceptional structural  
strength. Built the Clark way  
with skill—care—accuracy.

Clark Disc Steel Wheels  
are substantial in appearance  
—and in performance.

*Write for information on  
the new Clark Steel Wheel  
for pneumatic truck tires*

CLARK EQUIPMENT COMPANY  
Buchanan Michigan



*Clark Equipment is found  
only on good motor trucks*



## Shorten the Miles to Market

Thousands of additional miles of good roads are an imperative necessity during the nation's Reconstruction Period—

Paved highways to replace worn arteries of commerce—new roads blazed across lands and fields traversed until now only by rutted wagon trails.

In the national road improvement program now being fostered by the government, Federals are playing a big and vital part.

Brute strength—consistent service—day-after-day dependability and low operating cost are so nicely balanced in the truck's construction that Federals are to be found wherever the big jobs of better road building are in progress.

*Federal "Traffic News," an interesting magazine on motor haulage, will be sent on request to responsible executives.*

FEDERAL MOTOR TRUCK COMPANY  
DETROIT, MICHIGAN

# FEDERAL

One to Five Ton Capacities



# BUILD NOW THE NATIONAL STATE AND COUNTY ROADS

## That Are Needed



U. S. DEPARTMENT OF LABOR

W. B. WILSON,  
Secretary of Labor.

For additional copies address Roger W. Schoen, Director General, Information and Education Service, Department of Labor, 1700 O Street NW., Washington, D. C.

1918 STATE ROAD  
ENDS HERE

## MORE LIGHT MORE WORK

and Better Work—

No matter how many windows you have or how good your lighting system is—still your production will be increased by coating the workroom, walls and ceilings with

### *Cemcoat*

the light-reflecting, washable, sanitary wall coating. Reflected light from Cemcoated walls cost you nothing. It takes the place of expensive, additional, artificial lighting. Government statistics prove that a large part of wastage and accidents are due to poor lighting.

**"17% more production from increased light"**

Write for detailed description of this convincing test recently conducted by our illuminating engineer in a prominent factory.

Let us inspect your plant and show you how to increase production. No obligation implied.

**LAPIDOLITH**  
TRADE MARK

makes old or new concrete floors dust-free and wearproof by chemical action. Just flush it on. Used for years everywhere. Send for literature.

Cemcoat is furnished in gloss or flat, white and colors and for either interior or exterior walls.

Write for literature, testimonials and color card.

**L. SONNEBORN SONS, Inc.**  
Dept. 1, 264 Pearl St., New York



## *The Protector of the American Home*

**H**AVE you provided your family with the essential protection of a Colt Automatic Pistol or Revolver? Before you could summon the police must you face danger empty handed and cause a needless tragedy?

Our times are full of unrest during this period of reconstruction.

Give *Colt* protection to your home and property. Then the excuse of never needing it cannot be compared to the too late regret of not having had it.

The name *Colt* on a revolver or automatic pistol of whatever model you prefer (vest pocket or holster size) means the utmost possible in safety and protection—it means perfection of the art of gun making.

Your dealer will show you how it is impossible to forget to make a *Colt* safe.

**COLT'S PATENT FIRE ARMS MFG. COMPANY**  
HARTFORD, CONN., U. S. A.

## DU PONT AMERICAN INDUSTRIES



### The Sport That Thrills

The scurry of quail in the thicket is music to the sportsman's ear. But right here at home there's a sport with a thousand thrills—

### TRAPSHOOTING

Hundreds of gamey clay "birds"—each one a tantalizer—are waiting to test your gun-skill. Go out to your local gun club today and try your "hand." But go prepared—go with

**DU PONT Smokeless Shotgun Powder**

the choice of the Nation's crack shots. Look for the brand names, Dupont, Ballistite or Schultze on the shell box when you purchase.

Write for our free book "The Sport Alluring" and the name of your nearest gun club

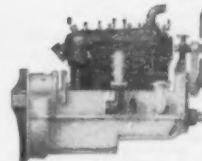
**SPORTING POWDER DIVISION**

**E. I. Du Pont de Nemours & Co.**  
Wilmington Delaware

## Look Beyond the Price Tag

Look a year—or two years ahead—and see what your car will be worth then—and how much it will cost you in the meantime.

You'll find it depends chiefly on the engine. If it's a Wisconsin the initial cost may be more—but a year or two from now it will have cost you far less and be in much better condition than some lower priced engine.



**Wisconsin Bearings**

are extra large. Made of Fabrig metal, backed with bronze. After being carefully reamed and scraped to a fit, they are assembled, run-in and then taken down to make sure that they have a 100% bearing surface.

There's a reason. First, a Wisconsin gets only the best workmanship and material. Second, when it leaves the factory it is *ready to run*. It has been carefully adjusted, run in and tested. Then torn down, inspected, reassembled, run in and adjusted again. Naturally this costs more, but it insures a motor that is *operation perfect*.

A Wisconsin is more than a motor—it is a *policy*. Write for particulars.

**WISCONSIN MOTOR MFG. CO.**  
Station A, Dept. 352, Milwaukee, Wis.

#### DISTRIBUTORS:

New York Branch: T. M. Fennel, 21 Park Row, Factory Rep.

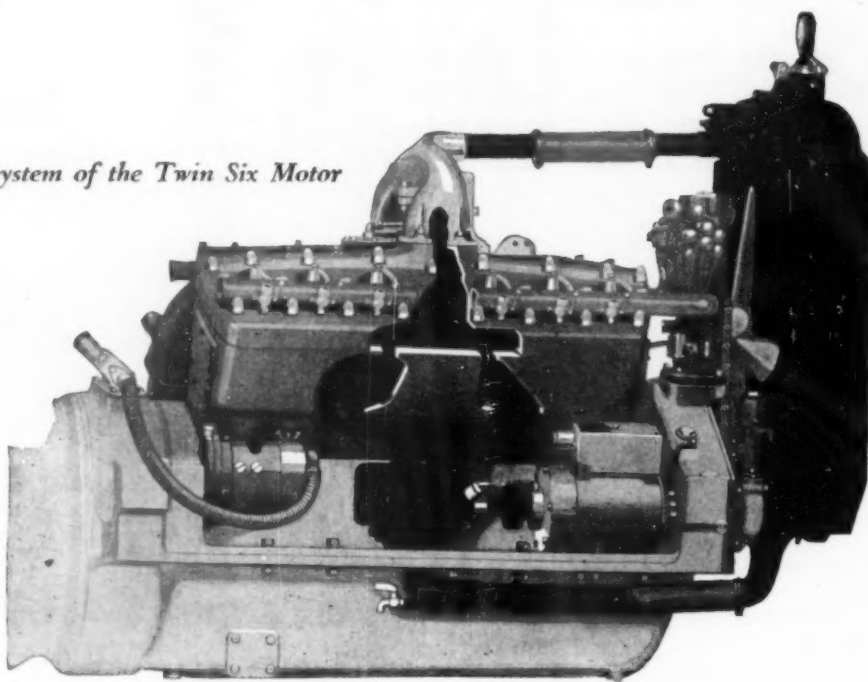
Marine Equipment & Supply Co., 610 Arch St., Philadelphia, Pa.

Pacific Coast Distributor: Earl P. Cooper Co., 1310 So. Los Angeles St., Los Angeles, Cal.

**Wisconsin**  
CONSISTENT

**H**ERE is a scientific principle many a motorist overlooks. No matter how fast or how slow you want to go, you cannot go right unless your car has reserve power—rightly applied. Until a man has driven the Packard Twin Six he will never know exactly what that means.

*Ample cooling system of the Twin Six Motor*



## Low Cost of Packard Reserve Power

**W**ITH everybody reading about motors, talking about motors, swapping motor experiences, you might suppose that the basic facts of motor engineering would be generally known by this time.

Yet even such a fundamental principle as the economic value of reserve power is not understood by one motorist in ten.

Some car owners take years to wake up to what it is costing them to compromise in the matter of power. Why should a man have to wear out one compromise car after another before he learns that it costs more to operate such a car than a car of high reserve power?

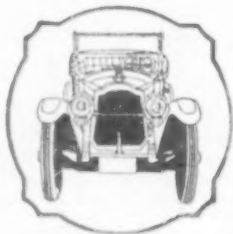
The man who has been through it all knows that the very reason why the Packard is good for 75 miles an hour is the reason why 25 miles an hour, day after day, costs less from the Packard than from the car of lower power.

In the Packard—the power is there—in reserve. It costs you nothing unless you use it. You call on it when you want it—and not unless you do want it.

The Packard Twin Six Engine is a motor of *live moving parts*. Power is used only in moving the car—not in excess, merely to keep the engine turning over.

The basic design of the Packard Twin Six motor has been wonderfully justified during the past few years of both peace and war work, so that any changes that may be made from time to time will be merely in the nature of refinements.

The Packard people are transportation experts. They have more to tell you on this subject than any other organization in the world. You can ask them to discuss your car problem without obligation. It is to your interest and profit to do so.



*"Ask the Man  
Who Owns One"*

**PACKARD MOTOR CAR COMPANY of Detroit**